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Research and Development Service  
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**FAA Rotorcraft Research,  
Engineering, and  
Development Bibliography,  
1962-1989**

AD-A224 256

Robert D. Smith

Vertical Flight Program Office  
Federal Aviation Administration  
Washington, D.C. 20591

May 1990

Bibliography

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<p>16. Abstract</p> <p>This is a bibliography of FAA rotorcraft reports published from 1962 through 1989. This report is a supplement to 'FAA Helicopter/Heliport Research, Engineering, and Development - Bibliography, 1964 - 1986' (FAA/PM-86/47) published in November 1986 (NTIS accession number ADA 174 697) and to 'FAA Rotorcraft Research, Engineering, and Development Bibliography, 1962-1988' (FAA/DS-89/03) published in March 1989 (NTIS accession number <del>ADA 207 162</del>). Both bibliographies are limited to documents in which the research, engineering, and development elements of the FAA were involved as sponsors, participants, or authors.</p> <p>This bibliography contains the abstracts of 68 technical reports. The indexes in this document address these 68 reports as well as the 53 reports in FAA/DS-98/03 and the 133 reports in FAA/PM-86/47. <i>Keywords:</i> <i>Helicopters bibliographies/indexes;</i></p>			
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1. **INTRODUCTION.** This bibliography has been assembled as an aid for those who are interested in rotorcraft research, engineering, and development. The intended audience includes people within the Federal Aviation Administration (FAA), in industry, and in state and local governments. This report is a supplement to "FAA Helicopter/Heliport Research, Engineering, and Development - Bibliography, 1964 - 1986" (FAA/PM-86/47) published in November 1986 (NTIS accession number ADA 174 697) and to "FAA Rotorcraft Research, Engineering, and Development Bibliography, 1962 - 1988" (FAA/DS-89/03) published in March 1989 (NTIS accession number ADA 207 162). The bibliography and indexes in this report include all of what was published in the earlier documents. However, Appendix F of this report does not contain any abstracts which were included in FAA/PM-86/47 or in FAA/DS-89/03. Abstracts herein are only for those reports which have been published subsequent to the earlier bibliography plus any earlier reports which had been overlooked inadvertently.

2. **SCOPE.** In selecting technical reports to be included in this bibliography, two limitations have been observed. First, the reports are specifically related, in whole or in part, to rotorcraft. Second, they are limited to reports in which the research, engineering, and development elements of the FAA have been involved as sponsors, participants, or authors.

3. **AVAILABILITY OF REPORTS.** The technical reports listed in this bibliography are readily available from three sources:

a. **National Technical Information Service (NTIS).** Many of the technical reports listed in this bibliography are available through NTIS. These documents can be identified by the accession number given after the listing of the document in Appendixes A and B. (In the example below, the accession is shown in bold.)

Example: Helipport Surface Maneuvering Test Results  
(Rosanne M. Weiss, Christopher J. Wolf, Scott L.  
Erlichman, John G. Morrow, Walter E. Dickerson)  
**(NTIS: ADA 214 116)**

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b. **American Helicopter Society (AHS).** Copies of virtually all of the technical reports listed in this bibliography have been given to AHS. Both AHS members and nonmembers may obtain copies of reports for a fee.

c. **Helicopter Association International (HAI).** Copies of virtually all of the technical reports listed in this bibliography have been given to HAI. HAI members may obtain copies of reports for a fee.

4. **ORDER OF THE LISTING.** In the chronological listing (Appendix B), technical reports are listed in order of the year in which they were published. Within the year of publication, reports are listed sequentially according to report number. Some reports do not include the year of publication as part of the document number. Such a report is listed after other reports published in the same year. (e.g., NAE-AN-26, published in 1985, is listed after the other reports published in 1985.)

5. **NEW REPORTS OF PARTICULAR INTEREST.** The following new technical reports cover topics of wide spread interest.

a. **FAA/PM-86/46      Aeronautical Decision Making - Cockpit Resource Management**

Commentary: Document a is the last of a family of six technical reports addressing judgment training for various pilot groups. The other reports in this family are shown below. One of these six training manuals specifically focuses on helicopter pilots. Industry spokesmen have stated that the implementation of this training has led to a significant reduction in their accident rates. The other five training reports are generic in nature and apply to both fixed-wing and rotary-wing pilots.

FAA/PM-86/41	Aeronautical Decision Making for Student and Private Pilots
FAA/PM-86/42	Aeronautical Decision Making for Commercial Pilots
FAA/PM-86/43	Aeronautical Decision Making for Instrument Pilots
FAA/PM-86/44	Aeronautical Decision Making for Instructor Pilots
FAA/PM-86/45	Aeronautical Decision Making for Helicopter Pilots

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- b. **FAA/DS-88/7      Risk Analysis for Air Ambulance Helicopter Operators**
- c. **FAA/DS-88/8      Aeronautical Decision Making for Air Ambulance Administrators**

Commentary: Documents b and c are the last of a family of four technical reports addressing judgment training for people involved with air ambulance helicopter operations. These two documents supplement the material contained in the following three reports:

FAA/PM-86/45      Aeronautical Decision Making for Helicopter Pilots

FAA/DS-88/5      Aeronautical Decision Making for Air Ambulance Helicopter Pilots: Learning from Past Mistakes

FAA/DS-88/6      Aeronautical Decision Making for Air Ambulance Helicopter Pilots: Situational Awareness Exercises.

- d. **FAA/CT-TN88/30    Heliport Surface Maneuvering Test Results**

Commentary: In the current Heliport Design advisory circular, there are no specific minimum dimensions for parking areas at private heliports (paragraph 16). At public heliports, the Heliport Design AC recommends a tip clearance of 1/3 rotor diameter but not less than 10 feet (paragraph 26a). Both this report and recent analysis of heliport parking area accidents indicate a need to reexamine minimum parking area requirements and markings.

- e. **FAA/AAM-89/9      Human Factors Issues in Aircraft Maintenance and Inspection**

Commentary: Document e contains the presentations made by government and industry at a two day public meeting in October 1988. It also contains recommendations regarding communication of maintenance information, consolidation of certain data bases of interest, expedited review of Federal Air Regulation (FAR) Part 147, and future research on maintenance concepts.

- f. **FAA/DS-89/37      An Early Overview of Tiltrotor Aircraft Characteristics and Pilot Procedures in Civil Tiltrotor Applications**

Commentary: Document f provides a preliminary look at the tiltrotor and procedures for vertiport approaches and departures. This report is based on limited analysis using a fixed-base flight simulator. The tiltrotor shows promise of steeper approach and departure maneuvers than what is possible with either an airplane or a helicopter.

6. **HELIPORT/VERTIPORT PLANNING/DESIGN REPORTS.** This is a list of FAA technical reports of particular interest to heliport planners and designers. Reports are listed sequentially according to the report number.

a. **FAA/PM-84/22, Heliport Snow and Ice Control Methods and Guidelines.** These guidelines provide a methodology to assist heliport planners and designers with the selection of the most appropriate snow and ice control method. The guidelines consider manual methods of snow and ice control such as plowing and chemical application, and automated methods such as pavement heating systems.

b. **FAA/PM-84/23, Structural Design Guidelines for Heliports.** Structural design guidelines for heliports are analyzed using data obtained from literature and from surveys of helicopter manufacturers, helicopter design consultants, and helicopter operators. Primary topics of interest are the loads on heliport structures caused by helicopter hard landings, rotorwash, and helicopter vibrations. Guidelines for appropriate load combinations for heliport structural design are also presented. This document could be useful in the design of rooftop heliports.

c. **FAA/PM-84/25, Evaluating Wind Flow Around Buildings on Heliport Placement.** Descriptions and illustrations of wind flow patterns and characteristics for both isolated and multiple building configurations are provided to assist heliport planners, operators, and helicopter pilots in understanding the problems associated with building-induced winds. Based on geometric flow patterns, general guidelines for ground level and rooftop heliport placement are provided. Recent rotorcraft accident analyses indicates that we, the rotorcraft community, could prevent a number of rotorcraft accidents at heliports and airports by paying more attention to these issues. This document would also be useful in evaluating the effect that a proposed building would have on operations at a particular heliport.

d. **FAA/PM-86/28, Investigation of Hazards of Helicopter Operations and Root Causes of Helicopter Accidents.** The acid test, of whether we (the rotorcraft community) are doing things correctly, is in our daily operations. Accident records can tell us when we have failed this test

and where we need to improve. This report documents a broad investigation of helicopter accidents. Based in part on the results of this effort, the FAA has three rotorcraft accident analyses ongoing. Each is focused on specific subsets of accidents. One of them is looking specifically at heliport accidents and incidents.

e. **FAA/PM-86/30, The Siting, Installation, and Operational Suitability of the Automated Weather Observing System (AWOS) at Heliports.** This document provides the basis for FAA recommendations on the installation and siting of AWOS at heliports. These recommendations can also be found in FAA Advisory Circular AC150/5220-16, Automated Weather Observing Systems (AWOS) for Non-Federal Applications. Both documents would be of interest to anyone considering the installation of an AWOS at a heliport.

f. **FAA/CT-TN87/4, Simulation Tests of Proposed Instrument Approach Lighting Systems for Heliport Operations.** This report documents some of the testing done to develop the configuration of the heliport approach light system (HALS). Testing documented in this report involved the use of a terrain board as the principal part of the simulation. Other documents in this list (see documents n and q) address flight testing of HALS.

g. **FAA/PM-87/31, Analysis of Heliport System Plans.** This study analyzed the strengths and weaknesses of four state and four metropolitan heliport system plans. Planning concepts are identified and defined to include:

- (1) baseline parameters for evaluating the plans,
- (2) identifying the data (and their sources) needed for planning purposes at any jurisdictional level, and
- (3) developing criteria for assessing the feasibility and economic viability of proposed heliport facilities.

h. **FAA/PM-87/32, Four Urban Heliport Case Studies.** This study developed case histories of four heliports built in the central business districts of major cities. The effort identified six essential elements of a successful heliport. Consideration of these elements would aid in the prediction of whether a proposed heliport will succeed or fail.

i. **FAA/PM-87/33, Heliport System Planning Guidelines.** This report provides recommendations on the content of a state or metropolitan heliport system plan. A subset of this information has been formatted to become a heliport system planning chapter in the FAA advisory circular on state airport system planning.

j. **FAA/CT-TN87/40, Heliport Visual Approach and Departure Airspace Tests, Vol. 1 Summary, Vol. 2 Appendixes.** This report contains measured data on the airspace consumed during heliport approaches and departures under VFR conditions. Data collection primarily addressed straight-in approaches and straight-out departures. However, a limited amount of curved approach and departure data were collected and additional collection of such data was recommended. This testing is part of an effort to determine objectively the minimum airspace required at a VFR heliport.

k. **FAA/CT-TN87/54, Analysis of Heliport Environmental Data: Indianapolis Heliport, Wall Street Heliport, Vol. 1 Summary, Vol. 2, Wall Street Heliport Data Plots, Vol. 3 Indianapolis Downtown Heliport Data Plots.** The measured data in these documents describe the magnitude of the rotor downwash generated by different types of helicopters in actual operations. Using these data, the FAA has developed computer software that show real time variation in the magnitude and direction of rotor downwash during these heliport operations. The next step in this effort is to analyze accidents caused by rotor downwash and to develop guidance on how to prevent such accidents. A separate document is being prepared to document similar tests at Intercoastal City, Louisiana.

l. **FAA/CT-TN88/5, Heliport Visual Approach Surface High Temperature and High Altitude Test Plan.** This was the plan for conducting flight tests at Albuquerque, NM. The Albuquerque tests were very similar to the (low altitude) tests conducted at the FAA Technical Center and documented in FAA/CT-TN87/40, Heliport Visual Approach and Departure Airspace Tests. Results of the Albuquerque tests are in preparation.

m. **FAA/DS-88/12, Minimum Required Heliport Airspace Under Visual Flight Rules.** This report is part of an effort to determine objectively the minimum airspace required at a VFR heliport. Industry has recommended that the FAA strive to be less subjective and more quantitative with regard to issues on heliport design. FAA testing has been conducted or is underway in several areas in response to this recommendation. A key element in making effective use of such quantitative data is the determination of an objective criteria for safety. This report discusses one method for developing such a basis: "target level of safety".

n. **FAA/CT-TN88/19, Test Plan for Helicopter Visual Segment Approach Light System (HALS).** This effort involved flight testing of MLS precision approaches both with and without a heliport approach lighting system (HALS). The intent was to make some judgments as to the precision approach minimums

with and without the HALS. Results are documented in FAA/CT-TN89/21. This flight testing took place at the FAA Technical Center Heliport.

**o. FAA/CT-TN88/45, Heliport Surface Maneuvering Test Results.** This report documents two ways of approaching the issue of minimum parking area requirements. The first involves daylight flight tests of 13 pilots in a UH-1 helicopter. The second involves industry pilot responses to questions on how close to an object they would be comfortable in operating.

Flight testing was done in a UH-1. The subject pilots were either National Guard pilots, FAA test pilots, or both. When interviewed after their flight testing, the majority of these pilots stated that they were comfortable with rotor tip clearances of one third the rotor diameter.

Industry pilots in the NY/NJ area, Louisiana, and Texas responded to questions concerning rotor tip clearances. Depending on wind conditions and on whether or not the object was an aircraft, only 19 to 41 percent of these pilots said that they were comfortable with rotor tip clearances of one third rotor diameter. Between 19 and 43 percent said that they were uncomfortable with less than one half rotor diameter tip clearances. Between 5 to 17 percent said that they were uncomfortable with less than a full rotor diameter tip clearance. Taken at face value, the results of the industry pilot questionnaires would support minimum parking area dimensions that provide a minimum tip clearance of one full rotor diameter for air taxi maneuvers.

In the current Heliport Design advisory circular, there are no specific minimum dimensions for parking areas at private heliports (paragraph 16). At public heliports, the Heliport Design AC recommends a tip clearance of 1/3 rotor diameter but not less than 10 feet (paragraph 26a). Both this report and recent analysis of heliport parking area accidents indicate a need to reexamine minimum parking area requirements and markings.

**p. FAA/CT-TN88/45 Heliport Night Parking Area Criteria Test Plan.** This is the plan to test heliport parking separations at night under various wind conditions. This effort is similar to a portion of the day time test effort documented in FAA/CT-TN88/30, Heliport Surface Maneuvering Test Results. This testing is underway at the FAA Technical Center.

**q. FAA/CT-TN89/21, Helicopter Visual Segment Approach Lighting System (HALS) Test Report.** This report documents flight testing of the heliport approach light system (HALS).

The HALS works very well in support of MLS precision approaches in an environment relatively devoid of city lights. In the absence of the HALS, several pilots were well inside the Decision Height (DH) when they made decisions to initiate a missed approach. This resulted in flights through airspace that present rules do not require to be obstacle free. Additional testing is planned to determine the appropriate weather minimums for precision approach operations in the absence of a HALS.

The FAA looks at lighting as one alternative for ensuring the safe operation of rotorcraft under lower minimums than what would otherwise be possible. The number of places that will require such a system is uncertain. However, the more alternatives available, the better the position the industry will be in to pick the combination of alternatives that make sense for each application of interest. As other alternatives become apparent, the FAA will test them to determine their benefits and limitations.

**APPENDIX A: ALPHABETICAL LIST OF REPORT TITLES**

FAA/DS-89/17      **Accident/Incident Data Analysis Database  
Summaries (2 Volumes)** (Thomas P. Murphy, Richard  
J. Levendoski)  
  
Vol-I: (NTIS: ADA 214 084)  
Vol-II: (NTIS: ADA 214 094)

FAA/PM-86/46      **Aeronautical Decision Making - Cockpit Resource  
Management** (Richard S. Jensen)  
(NTIS: ADA 205 115)

FAA/DS-88/5      **Aeronautical Decision Making for Air Ambulance  
Helicopter Pilots: Learning from Past Mistakes**  
(Richard J. Adams and Jack T. Thompson)  
(NTIS: ADA 197 694)

FAA/DS-88/6      **Aeronautical Decision Making for Air Ambulance  
Helicopter Pilots: Situational Awareness  
Exercises** (Richard J. Adams, Jack T. Thompson)  
(NTIS: ADA 200 274)

FAA/DS-88/8      **Aeronautical Decision Making for Air Ambulance  
Helicopter Program Administrators**  
(Richard J. Adams and Edwin D. McConkey)  
(NTIS: ADA 219 404)

FAA/PM-86/42      **Aeronautical Decision Making for Commercial  
Pilots** (Richard S. Jensen, Janeen Adrion)  
(NTIS ADA 198 772)

FAA/PM-86/45      **Aeronautical Decision Making for Helicopter  
Pilots** (Richard J. Adams, Jack L. Thompson)  
(NTIS: ADA 180 325)

FAA/PM-86/44      **Aeronautical Decision Making for Instructor  
Pilots** (Georgette D. Buch, Russell S. Lawton,  
Gary S. Livack) (NTIS ADA 182 611)

FAA/PM-86/43      **Aeronautical Decision Making for Instrument  
Pilots** (Richard S. Jensen, Janeen Adrion,  
Russell S. Lawton) (NTIS ADA 186 112)

FAA/PM-86/41      **Aeronautical Decision Making for Student and  
Private Pilots** (Alan E. Diehl, Peter V.  
Hwoschinsky, Gary S. Livack, Russell S. Lawton)  
(NTIS ADA 182 549)

Appendix A: Alphabetical Listing

FAA-RD-73-47 FAA-NA-72-95	<b>(Air Traffic Control) ATC Concepts for V/STOL Vehicles, Parts 1 and 2</b> (Sidney B. Rossiter, John Maurer, Paul J. O'Brien) (NTIS: AD 759 864)
FAA-RD-80-22 FAA-NA-79-56	<b>Airborne Radar Approach</b> (Cliff Mackin) (NTIS: ADA 103 347)
FAA-RD-80-60	<b>Airborne Radar Approach Flight Test Evaluating Various Track Orientation Techniques</b> (Larry D. King) (NTIS: ADA 088 426)
FAA-RD-79-99	<b>Airborne Radar Approach System Flight Test Experiment</b> (Larry D. King, Richard J. Adams) (NTIS: ADA 077 900)
FAA/PM-86/25	<b>Aircraft Avionics Suitable for Advanced Approach Applications</b> (Stanley Kowalski, Thomas H. Crosswell) Volume I: Aircraft Fleet Equipage (NTIS: ADA 170 079)
FAA/CT-89/22	<b>Aircraft Lightning Protection Handbook</b> (F.A. Fisher, J.A. Plumer, R.A. Perala) (NTIS: ADA )
FAA-RD-78-143	<b>Aircraft Wake Vortex Takeoff Tests at Toronto International Airport</b> (Thomas Sullivan, James Hallock, Berl Winston, Ian McWilliams, David C. Burnham) (NTIS: ADA 068 925)
FAA/PM-83/4	<b>Alaska LORAN-C Flight Test Evaluation</b> (Larry D. King, Edwin D. McConkey) (NTIS: ADA 123 633)
FAA/CT-82/120	<b>All Weather Heliport</b> (Paul H. Jones)
FAA/CT-TN83/50 and Addendum 1	<b>Altitude Aided GPS</b> (George Paolacci)
FAA-EE-86-01	<b>Analysis of Helicopter Noise Using International Helicopter Certification Procedures</b> (J. Steven Newman, Edward J. Rickley, Dennis A. Levanduski, Susan B. Woolridge) (NTIS: ADA 167 446)
FAA/CT-TN87/54	<b>Analysis of Heliport Environmental Data: Indianapolis Downtown Heliport, Wall Street Heliport</b> (Rosanne M. Weiss, John G. Morrow, Donald Gallagher, Mark DiMeo, Scott Erlichman)  Vol-I: Summary (NTIS: ADA 206 708)

Appendix A: Alphabetical Listing

Vol-II: Wall Street Heliport Data Plots  
(NTIS: ADA 212 312)

Vol-III: Indianapolis Downtown Heliport Data  
Plots (NTIS: ADA 217 412)

FAA/PM-87/31      **Analyses of Heliport System Plans**  
FAA/PP-88/1      (Deborah Peisen, Jack T. Thompson)  
                    (NTIS: ADA 195 283)

FAA/CT-85/11      **Analysis of Rotorcraft Crash Dynamics for  
Development of Improved Crashworthiness Design  
Criteria** (Joseph W. Coltman, Akif O. Bolukbasi,  
David H. Laananen) (NTIS: ADA 158 777)

NA-67-1            **Analysis of the Helicopter Height Velocity  
DS-67-23          Diagram Including a Practical Method for its  
Determination** (William J. Hanley, Gilbert  
Devore) (NTIS: AD 669 481)

RD-64-55          **Analytical Determination of the Velocity Fields  
in the Wakes of Specified Aircraft**  
(W.J. Bennett) (NTIS: AD 607 251)

FAA/CT-86/35      **Analytical Study of Icing Similitude for  
Aircraft Engine Testing** (C. Scott Bartlett)  
(NTIS: ADA 180 863)

FAA-RD-71-96      **Analytical Study of the Adequacy of VOR/DME and  
FAA-NA-71-45      DME/DME Guidance Signals for V/STOL Area  
Navigation in the Los Angeles Area**  
(Bernhart V. Dinerman) (NTIS: AD 735 399)

FAA/RD-82/40      **Application of the MLS to Helicopter Operations**  
(Edwin D. McConkey, John B. McKinley,  
Ronald E. Ace) (NTIS: PB-84 116458)

FAA-AEE-79-13     **Assessment of the Environmental Compatibility of  
Differing Helicopter Noise Certification  
Standards** (Richard G. Edwards, Alvin B.  
Broderon, Roger W. Barbour, Donald F. McCoy,  
Charles W. Johnson) (NTIS: ADA 080 525)

FAA-RD-73-47      **ATC Concepts for V/STOL Vehicles, Parts 1 and 2**  
FAA-NA-72-95      (Sidney B. Rossiter, John Maurer,  
Paul J. O'Brien) (NTIS: AD 759 864)

FAA/CT-87/19      **Avionics System Design for High Energy Fields**  
(Roger A. McConnell) (NTIS: ADA 199 212)

Appendix A: Alphabetical Listing

FAA-EM-77-15	<b>Bibliography: Airports</b> (Transportation Research Board) (NTIS: ADA 049 879)
FAA-EM-73-8	<b>Civil Aviation Midair Collisions Analysis, January 1964 - December 1971</b> (T.R. Simpson, R.A. Rucker, J.P. Murray) (NTIS: AD 766 900)
FAA-EM-73-8 Addendum 1	<b>Civil Aviation Midair Collisions Analysis, 1972 Added to 1964-1971 Results</b> (R.A. Rucker, T.R. Simpson) (NTIS: ADA 005 897)
FAA-NA-72-41	<b>Collision Avoidance: An Annotated Bibliography, September 1968 --- April 1972</b> (Dorothy E. Bulford) (NTIS: AD 746 863)
FAA-RD-76-146	<b>Comparison of Air Radionavigation Systems (For Helicopters In Off-Shore Areas)</b> (George H. Quinn) (NTIS: ADA 030 337)
FAA-EE-81-4	<b>Comprehensive Bibliography of Literature on Helicopter Noise Technology</b> (A.M. Carter, Jr.) (NTIS: ADA 103 331)
FAA-RD-75-79	<b>Comprehensive Review of Helicopter Noise Literature</b> (B. Magliozzi, F.B. Metzger, W. Bausch, R.J. King) (NTIS: ADA 014 640)
FAA/CT-TN85/63	<b>Computed Centerline MLS Approach Demonstration at Washington National Airport</b> (James H. Remer) (NTIS: ADA 163 722)
FAA/PM-83-32	<b>Conus LORAN-C Error Budget: Flight Test</b> (Larry D. King, Kristen J. Venezia, Edwin D. McConkey) (NTIS: ADA 140 264)
FAA-EE-80-42	<b>Correlation of Helicopter Noise Levels with Physical and Performance Characteristics</b> (J. Stephen Newman) (NTIS: ADA 093 428)
FAA/CT-TN85/15	<b>Course Width Determination for Collocated MLS at Heliports</b> (James H. Enias)
FAA/CT-87/37	<b>De-icing of Aircraft Turbine Engine Inlets</b> (H. Rosenthal, D. Nelepovitz, H. Rockholt) (NTIS: ADA 199 162)
FAA/CT-86/8	<b>Determination of Electrical Properties of Grounding, Bonding and Fastening Techniques for Composite Materials</b> (William W. Cooley) (NTIS: ADA 182 744)

Appendix A: Alphabetical Listing

FAA/RD-81/35      **Development of a Heliport Classification Method and an Analysis of Heliport Real Estate and Airspace Requirements** (F.D. Smith, Albert G. Delucien) (NTIS: ADA 102 521)

FAA/CT-88/10      **Digital Systems Validation Handbook - Volume II** (R.L. McDowall, Hardy P. Curd, Lloyd N. Popish, Donald Elredge, Susan Mangold, William W. Cooley, Deborah L. Shortess, Myron J. Hecht, John G. McGough, Clifton A. Clarke, William E. Larsen, Roger McConnell, Barbara G. Melander, John E. Reed, Robert E. Evans) (NTIS: ADA 211 451) (Volume I was published as FAA/CT-82/115)

FAA/DS-89/37      **Early Overview of Tiltrotor Aircraft Characteristics and Pilot Procedures in Civil Tiltrotor Applications** (David L. Green, Harold Andrews, Michael Saraniero)

RD-67-36          **Economic and Technical Feasibility Analysis of Establishing an All-Weather V/STOL Transportation System** (Joseph M. Del Balzo) (NTIS: AD 657 330)

FAA/RD-82/63      **EMC Analysis of a Prototype Civil-Use GPS Receiver on Four Aircraft Configurations** (Robert L. Mullen) (NTIS: ADA 119 578)

FAA/CT-83/7       **Engineering and Development Program Plan, Aircraft Icing**

FAA-CT-81-180     **Engineering and Development Program Plan, Helicopter Icing Technology Research** (NTIS: ADA 182 546)

FAA/PM-84/25      **Evaluating Wind Flow Around Buildings on Heliport Placement** (John B. McKinley) (NTIS: ADA 153 512)

FAA-RD-70-10  
FAA-NA-70-7       **Evaluation of LORAN-C/D Airborne Systems** (George H. Quinn) (NTIS: AD 705 507)

FAA/CT-TN86/30   **Evaluation of MLS for Helicopter Operations, Optimum Course Width Tailoring Flight Test Plan** (Michael M. Webb)

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FAA/CT-TN86/31	<b>Evaluation of Sikorsky S-76A, 24 Missed Approach Profiles Following Precision MLS Approaches to a Helipad at 40 KIAS (Michael M. Webb)</b> (NTIS: ADA 175 407)
FAA/PM-86/15 NASA CR-177408	<b>Evaluation of the Usefulness of Various Simulation Technology Options for Terminal Instrument Procedures (TERPS) Enhancements (Anil V. Phatak, John A. Sorensen)</b> (NTIS: ADA 169 893)
FAA/CT-88/21	<b>Experimental Guidelines for the Design of Turbine Rotor Fragment Containment Rings (James T. Salvino, Robert A. DeLucia, Tracy Russo)</b> (NTIS: ADA 199 163)
FAA/RD-82/9 FAA/CT-81/75	<b>FAA Acceptance Tests on the Navigation System Using Time and Ranging Global Positioning System Z-Set Receiver (Robert J. Esposito)</b> (NTIS: ADA 119 306)
FAA/PM-86/47	<b>FAA Helicopter/Heliport Research, Engineering, and Development Bibliography, 1964 - 1986 (Robert D. Smith)</b> (NTIS: ADA 174 697)
PS-88-1-LR	<b>FAA Rotorcraft Research, Engineering, and Development Bibliography, 1964-1987 (Robert D. Smith)</b>
FAA/DS-89/03	<b>FAA Rotorcraft Research, Engineering, and Development - Bibliography 1962 - 1988 (Robert D. Smith)</b> (NTIS: ADA 207 162)
FAA-RD-80-18 FAA-NA-80-8	<b>Flight Evaluation of a Radar Cursor Technique as an Aid to Airborne Radar Approaches (Joseph Perez)</b> (NTIS: ADA 084 015)
FAA-RD-81-27 FAA-CT-80-53	<b>Flight Evaluation of LORAN-C as a Helicopter Navigation Aid in the Baltimore Canyon Oil Exploration Area (William A. Lynn)</b> (NTIS: ADA 105 260)
FAA-EE-85-7	<b>Flight Operations Noise Tests of Eight Helicopters (Sharon A. Yoshikami)</b> (NTIS: ADA 159 835)
FAA-RD-72-133 FAA-NA-72-89	<b>Flight Test and Evaluation of Heliport Lighting for IFR (Thomas H. Paprocki)</b> (NTIS: AD 753 058)

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NA-69-2 RD-68-61	<b>Flight Test and Evaluation of Heliport Lighting for VFR</b> (Richard L. Sulzer, Thomas H. Paprocki) (NTIS: AD 683 680)
FAA/RD-82/7 FAA/CT-81/72	<b>Flight Test Investigation of Area Calibrated LORAN-C for En Route Navigation in the Gulf of Mexico</b> (John G. Morrow) (NTIS: ADA 121 169)
FAA-RD-80-47 FAA-CT-80-18	<b>Flight Test Investigation of LORAN-C for En Route Navigation in the Gulf of Mexico</b> (Robert H. Pursel) (NTIS: ADA 091 637)
FAA/CT-82/103	<b>Flight Test Route Structure Statistics of Helicopter GPS Navigation with the Magnavox Z-Set</b> (Robert D. Till)
FAA/CT-TN86/11	<b>Fluid Ice Protection Systems</b> (Larry Hackler, Ralph Rissmiller, Jr.)
FAA/PM-87/32 FAA/PP-88/2	<b>Four Urban Heliport Case Studies</b> (Deborah Peisen, Jack T. Thompson) (NTIS: ADA 195 284)
FAA/CT-83/6	<b>General Aviation Safety Research Issues</b> (Robert J. Ontiveros) (NTIS: ADA 130 074)
FAA/RD-82/71 FAA/CT-82/64	<b>Global Positioning System En Route/Terminal Exploratory Test</b> (Jerome T. Connor, Robert J. Esposito, Philip Lizzi) (NTIS: ADA 125 459)
FAA/CT-TN84/47	<b>Global Positioning System Performance During FAA Helicopter Tests on Rotor Effects</b> (Jerome T. Connor, George Paolacci)
FAA/CT-TN85/5	<b>Gulf of Mexico Helicopter Loran C Stability Study</b> (Rosanne M. Weiss)
FAA-CT-80-198	<b>Helicopter Air/Ground Communications</b> (James Coyle)
FAA-RD-78-150	<b>Helicopter Air Traffic Control Operations</b> (NTIS: ADA 072 793)
FAA-RD-81-59	<b>Helicopter Area Air Traffic Control Demonstration Plan</b> (Tirey K. Vickers, D. James Freund) (NTIS: ADA 174 973)
FAA-RD-80-20	<b>Helicopter Communications System Study</b> (Michael White, Dana Swann) (NTIS: ADA 182 703)

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FAA/CT-TN83/03	<b>Helicopter Global Positioning System Navigation with the Magnavox Z-Set</b> (Robert D. Till)
FAA-CT-80-210	<b>Helicopter Icing Review</b> (A.A. Peterson, L.U. Dadone) (NTIS: ADA 094 175)
FAA/CT-TN84/34	<b>Helicopter IFR Lighting and Marking Preliminary Test Results</b> (Paul H. Jones)
FAA/CT-TN86/63	<b>Helicopter Maneuvering: MLS Shuttle Holding Pattern Data Report</b> (Christopher J. Wolf, Raquel Y. Santana)
FAA/CT-TN84/20	<b>Helicopter MLS Collocated Flight Test for TERPS Data</b> (James H. Enias, Paul Maenza, Donald P. Pate)
FAA/CT-TN84/16	<b>Helicopter MLS (Collocated) Flight Test Plan to Determine Optimum Course Width</b> (James H. Enias)
FAA/AVN-200/25 (June 1986)	<b>Helicopter Microwave Landing System (MLS) Flight Test</b> (Charles Hale, Paul Maenza)
FAA/CT-TN85/43	<b>Helicopter MLS RNAV Development and Flight Test Project, Project Plan</b> (James H. Remer)
FAA-EE-81-13	<b>Helicopter Noise Analysis - Round Robin Test</b> (Edward J. Rickley) (NTIS: ADA 103 724)
FAA-EE-80-41	<b>Helicopter Noise Contour Development Techniques and Directivity Analysis</b> (J. Steven Newman) (NTIS: ADA 093 426)
FAA-EE-81-16	<b>Helicopter Noise Definition Report: UH-60A, S-76, A-109, 206-L</b> (J. Steven Newman, Edward J. Rickley, David W. Ford) (NTIS: ADA 116 363)
FAA-EE-82-16	<b>Helicopter Noise Exposure Curves for Use in Environmental Impact Assessment</b> (J. Steven Newman, Edward J. Rickley, Tyrone L. Bland) (NTIS: ADA 123 467)
FAA-AEE-80-34	<b>Helicopter Noise Exposure Level Data: Variations with Test Target</b> (J. Steven Newman) (NTIS: ADA 100 691)

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FAA-RD-77-57      **Helicopter Noise Measurements Data Report**  
(Harold C. True, Richard M. Letty)

Vol-I:      Helicopter Models: Hughes 300-C,  
                 Hughes 500-C, Bell 47-G, Bell 206-L  
                 (NTIS: ADA 040 561)

Vol-II:      Helicopter Models: Bell 212 (UH-IN),  
                 Sikorsky S-61 (SH-3A), Sikorsky S-64  
                 "Skycrane" CH-54B, Boeing Vertol  
                 "Chinook" (CH-47C) (NTIS: ADA 040 562)

FAA-EE-83-2      **Helicopter Noise Survey at Selected New York**  
**City Heliports** (E.J. Rickley, M.J. Brien,  
Steven R. Albersheim) (NTIS: ADA 129 167)

FAA-EE-83-6      **Helicopter Noise Survey Conducted at Norwood,**  
**Massachusetts on April 27, 1983** (Steven R.  
Albersheim) (NTIS: ADA 131 053)

FAA-EE-85-3      **Helicopter Noise Survey for Selected Cities in**  
**the Contiguous United States** (Robert Main,  
Andrew Joshi, David Coutts, Leslie Hilten)  
(NTIS: ADA 154 893)

FAA-EE-84-15      **Helicopter Noise Survey Performed at Las Vegas,**  
**Nevada, January 19-21, 1984** (Steven R.  
Albersheim) (NTIS: ADA 147 392)

FAA-EE-83-5      **Helicopter Noise Survey Performed at Parker**  
**Center, Pasadena, and Anaheim California on**  
**February 10-14, 1983** (Steven R. Albersheim)  
(NTIS: ADA 130 962)

FAA-RD-80-80      **Helicopter Northeast Corridor Operational Test**  
**Support** (Glen A. Gilbert) (NTIS: ADA 088 151)

FAA-RD-78-101      **Helicopter Operations Development Plan**  
(NTIS: ADA 061 921)

FAA/CT-TN85/24      **Helicopter Terminal Instrument Approach**  
**Procedures (VOR/ILS)** (Christopher Wolf)

FAA-RD-80-59      **Helicopter Terminal Instrument Procedures**  
**(TERPS) Development Program** (NTIS: ADA 088 150)

FAA/PM-85/6      **Helicopter User Survey: TCAS** (Frank R. Taylor,  
Richard J. Adams) (NTIS: ADA 155 415)

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FAA/CT-TN89/21	<b>Helicopter Visual Segment Approach Lighting System (HALS) Test Report</b> (Barry Billmann, Scott B. Schollenberger) (NTIS: ADA 214 085)
FAA-RD-71-105	<b>Heliport Beacon Design, Construction, and Testing</b> (Fred Walter) (NTIS: AD 745 514)
FAA/CT-TN86/64	<b>Heliport Critical Area Flight Test Results</b> (Barry R. Billmann, Michael M. Webb, John Morrow, Donald W. Gallagher, Christopher J. Wolf) (NTIS: ADA 183 153)
PM-85-2-LR	<b>Heliport Design Guide, Workshop Report Vol I: Executive Summary</b>
PM-85-3-LR	<b>Heliport Design Guide, Workshop Report Vol II: Appendixes</b>
PM-85-4-LR	<b>Heliport Design Guide, Workshop Report Vol III: Viewgraphs</b>
FAA/CT-TN86/22	<b>Heliport Electroluminescent (E-L) Lighting System, Preliminary Evaluation</b> (Paul H. Jones)
FAA/CT-TN89/31	<b>Heliport Identification Beacon</b> (Paul H. Jones)
FAA/CT-TN85/64	<b>Heliport MLS Critical Area Flight Tests</b> (Robert S. Jeter)
FAA/CT-TN86/42	<b>Heliport MLS Decelerating Test Plan</b> (Scott B. Schollenberger, Barry R. Billmann)
FAA/CT-TN86/14	<b>Heliport MLS Flight Inspection Project</b> (Scott Shollenberger, Barry R. Billmann)
FAA/CT-TN84/40	<b>Heliport MLS Siting Evaluation</b> (Scott B. Shollenberger)
FAA/CT-TN88/45	<b>Heliport Night Parking Area Criteria Test Plan</b> (Marvin S. Plotka, Rosanne M. Weiss) (NTIS: ADA 208 401)
FAA/EE-88-2	<b>Heliport Noise Model (HNM) Version 1 User's Manual</b> (D. Keast, K. Eldred, J. Purdum) (NTIS: ADA 219 555)
FAA/CT-TN87/10	<b>Heliport Parking, Taxiing, and Landing Area Criteria Test Plan</b> (Rosanne M. Weiss) (NTIS: ADA 189 141)

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FAA/PM-84/22      **Heliport Snow and Ice Control, Methods and Guidelines** (John B. McKinley, Robert B. Newman)  
(NTIS: ADA 148 137)

FAA/CT-TN88/30    **Heliport Surface Maneuvering Test Results**  
(Rosanne M. Weiss, Christopher J. Wolf, Scott L. Erlichman, John G. Morrow, Walter E. Dickerson)  
(NTIS: ADA 214 116)

FAA/PM-87/33      **Heliport System Planning Guidelines**  
FAA/PP-88/3      (Deborah Peisen) (NTIS: ADA 199 081)

FAA/CT-TN87/40    **Heliport Visual Approach and Departure Airspace Tests** (Rosanne M. Weiss, Christopher J. Wolf, Maureen Harris, James Triantos)

Vol-I:      Summary (NTIS: ADA 200 028)  
Vol-II:      Appendixes

FAA/CT-TN88/5      **Heliport Visual Approach Surface High Temperature and High Altitude Test Plan**  
(Marvin S. Plotka, Rosanne M. Weiss)  
(NTIS: ADA 200 027)

FAA/CT-TN86/61    **Heliport Visual Approach Surface Testing Test Plan** (Rosanne M. Weiss, John R. Sackett)  
(NTIS: ADA 179 897)

FAA/AAM-89/9      **Human Factors Issues in Aircraft Maintenance and Inspection** (James F. Parker Jr., William T. Shepherd) (NTIS: ADA 215 724)

FAA-RD-76-1      **Human Response to Sound: The Calculation of Perceived Level, PLdB (Noisiness or Loudness) Directly From Physical Measures**  
(Thomas H. Higgins) (NTIS: ADA 035 677)

FAA-EE-87-2      **ICAO Helicopter Noise Measurement Repeatability Program** (J. Steven Newman, Maryalice Locke)  
(NTIS: ADA 188 540)

FAA-EE-85-6      **ICAO Helicopter Noise Measurement Repeatability Program, Bell 206L-1 Noise Measurement Flight Test** (J. Steven Newman, Maryalice Locke)  
(NTIS: ADA 159 898)

FAA-RD-80-24      **Icing Characteristics of Low Altitude, Super Cooled Layer Clouds** (Richard K. Jeck)  
(NTIS: ADA 088 892)

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FAA-RD-81-9	<b>Impact of Low Altitude Coverage Requirements on Air-Ground Communications</b> (B. Magenheim) (NTIS: ADA 101 642)
FAA-EE-81-10	<b>Impact of Prediction Accuracy on Costs - Noise Technology Applications in Helicopters</b> (R.H. Spencer, H. Sternfeld, Jr.) (NTIS: ADA 101 768)
FAA/RD-81/40	<b>Improved Weather Services for Helicopter Operations in the Gulf of Mexico</b> (Arthur Hilsenrod) (NTIS: ADA 102 209)
FAA-NA-72-39	<b>Index of NAFEC Technical Reports, 1967-1971</b> (NTIS: AD 742 849)
FAA-CT-81-54	<b>Index of National Aviation Facilities Experimental Center Technical Reports, 1972-1977</b> (Ruth J. Farrell, Nancy G. Boylan) (NTIS: ADA 104 759)
FAA/DS-89/32	<b>Indianapolis Downtown Heliport - Operations Analysis and Marketing History</b> (Robert B. Newman and Deborah J. Peisen) (NTIS: ADA )
FAA/RD-82/8 FAA/CT-81/73	<b>Initial FAA Tests on the Navigation System Using Time and Ranging Global Positioning System Z-Set Receiver</b> (Robert J. Esposito) (NTIS: ADA 119 289)
FAA/RD-82/6	<b>Instrument Approach Aids for Helicopter</b> (Edwin D. McConkey, Ronald E. Ace) (NTIS: ADA 120 678)
FAA/PM-86/28	<b>Investigation of Hazards of Helicopter Operations and Root Cases of Helicopter Accidents</b> (Franklin R. Taylor, Rich J. Adams) (NTIS: ADA 171 994)
NAE-AN-55 (1988)	<b>Investigation of Lateral Tracking Techniques, Flight Directors and Automatic Control Coupling on Decelerating IFR Approaches for Rotorcraft</b> (S. Baillie, Stan Kereliuk and Roger H. Hoh)
NA-78-55-LR	<b>Limited Test of LORAN-C and Omega for Helicopter Operations in the Offshore New Jersey Area</b> (Robert H. Pursel)

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FAA/RD-82/24 FAA/CT-82/32	<b>LORAN-C En Route Accuracies in the Central Appalachian Region</b> (Frank Lorge) (NTIS: ADA 123 465)
FAA-CT-80-175	<b>LORAN-C Non-Precision Approaches in the Northeast Corridor</b> (Frank Lorge)
FAA/RD-82/78 FAA/CT-82/76	<b>LORAN-C Nonprecision Approaches in the Northeast Corridor</b> (Frank Lorge) (NTIS: ADA 131 034)
FAA/CT-TN88/8	<b>LORAN-C Offshore Flight Following (LOFF) In the Gulf of Mexico</b> (Frank Lorge) (NTIS: ADA 197 779)
FAA/CT-TN86/17	<b>LORAN Offshore Flight Following Project Plan</b> (Jean Evans, Frank Lorge)
FAA/CT-TN86/56	<b>LORAN-C VNAV Approaches to the FAA Technical Center Heliport</b> (Michael Magrogan) (NTIS: ADA 182 152)
FAA/CT-TN87/19	<b>Microwave Landing System Area Navigation (MLS RNAV) Transformation Algorithms and Accuracy Testing</b> (Barry Billmann, James H. Remer, Min-Ju Chang) (NTIS: ADA 189 424)
FAA/DS-88/12	<b>Minimum Required Heliport Airspace Under Visual Flight Rules</b> (Robert D. Smith) (NTIS: ADA 201 433)
FAA/PM-85/7	<b>MLS for Heliport Operators, Owners, and Users</b> (Kristen J. Venezia, Edwin D. McConkey) (NTIS: ADA 157 367)
FAA/CT-81/35	<b>National Icing Facilities Requirements Investigation</b> (Frank R. Taylor, Richard J. Adams) (NTIS: ADA 102 520)
FAA/CT-83/22	<b>New Characterization of Supercooled Clouds Below 10,000 Feet AGL</b> (Charles O. Masters) (NTIS: ADA 130 946)
FAA/CT-83/21 NRL Report 8738	<b>New Data Base of Supercooled Cloud Variables for Altitudes up to 10,000 Feet AGL and the Implications for Low Altitude Aircraft Icing</b> (Richard K. Jeck) (NTIS: ADA 137 589)
FAA-RD-76-116	<b>Noise Certification Considerations for Helicopters Based on Laboratory Investigations (MAN-Acoustics and Noise)</b> (NTIS: ADA 032 028)

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FAA-RD-75-190      **Noise Certification Criteria and Implementation Considerations for V/STOL Aircraft**  
(MAN-Acoustics and Noise, Inc.)  
(NTIS: ADA 018 036)

FAA-RD-77-94      **Noise Characteristics of Eight Helicopters**  
(Harold C. True, E.J. Rickley)  
(NTIS: ADA 043 842)

FAA-EE-79-03      **Noise Levels and Flight Profiles of Eight Helicopters Using Proposed International Certification Procedures** (J. Steven Newman, Edward J. Rickley) (NTIS: ADA 074 532)

FAA-EE-86-04      **Noise Levels from Urban Helicopter Operations, New Orleans, Louisiana** (Steven R. Albersheim)  
(NTIS: ADA 174 129)

FAA-EE-84-05      **Noise Measurement Flight Test for the Aerospatiale AS 350D AStar Helicopter: Data and Analyses** (J. Steven Newman, Edward J. Rickley, Kristy R. Beattie, Tyrone L. Bland)  
(NTIS: ADA 148 496)

FAA-EE-84-04      **Noise Measurement Flight Test for the Aerospatiale AS 355F TwinStar Helicopter: Data/Analyses** (J. Steven Newman, Edward J. Rickley, Kristy R. Beattie, Tyrone L. Bland)  
(NTIS: ADA 147 497)

FAA-EE-84-2      **Noise Measurement Flight Test for the Aerospatiale SA 354N Dauphin 2 Twin Jet Helicopter: Data and Analyses** (J. Steven Newman, Edward J. Rickley, Sharon A. Daboin, Kristy R. Beattie) (NTIS: ADA 143 229)

FAA-EE-84-1      **Noise Measurement Flight Test for the Bell 222 Twin Jet Helicopter: Data and Analyses**  
(J. Steven Newman, Edward J. Rickley, Tyrone L. Bland, Sharon A. Daboin) (NTIS: ADA 139 906)

FAA-EE-84-7      **Noise Measurement Flight Test for the Boeing Vertol 234/CH 47-D Helicopter: Data/Analyses**  
(J. Steven Newman, Edward J. Rickley, Tyrone L. Bland, Kristy R. Beattie) (NTIS: ADA 148 172)

FAA-EE-84-3      **Noise Measurement Flight Test for the Hughes 500D/E: Data and Analyses** (J. Steven Newman, Edward J. Rickley, Kristy R. Beattie, Tyrone L. Bland) (NTIS: ADA 148 110)

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FAA-EE-84-6	<b>Noise Measurement Flight Test for the Sikorsky S-76A Helicopter: Data and Analyses</b> (J. Steven Newman, Edward J. Rickley, Tyrone L. Bland, Kristy R. Beattie) (NTIS: ADA 148 525)
FAA/CT-TN85/17	<b>Nonprecision Approaches in the Northeast Corridor Using Second Generation Loran Receivers</b> (Barry Billmann, John G. Morrow, Christopher Wolf)
FAA/CT-82/57	<b>Northeast Corridor Helicopter Area Navigation Accuracy Evaluation</b> (Jack D. Edmonds) (NTIS: ADA 117 445)
FAA-RD-80-17 FAA-NA-80-13	<b>Northeast Corridor User Evaluation</b> (Joseph Harrigan) (NTIS: ADA 088 024)
FAA/PM-85/30	<b>Pilot Evaluation of TCAS in the Long Ranger Helicopter</b> (John W. Andrews) (NTIS: ADA 169 076)
FAA/CT-TN85/55	<b>Pilot Inflight Evaluation of MLS Procedures at Heliports</b> (James H. Enias)
FAA-RD-80-64 NASA TM-81188	<b>Piloted Simulator Investigation of Static Stability and Stability/Control Augmentation Effects on Helicopter Handling Qualities for Instrument Approach</b> (J. Victor Lebacqz, R.D. Forrest, R.M. Gerdes) (NTIS: ADA 093 654)
FAA-RD-79-59	<b>Powered-Lift Aircraft Handling Qualities in the Presence of Naturally-Occurring and Computer-Generated Atmospheric Disturbances</b> (Wayne F. Jewell, Warren F. Clement, Thomas C. West, Dr. S.R.M. Sinclair) (NTIS: ADA 072 118)
NAE-AN-26 NRC No. 24173 February 1985	<b>Preliminary Investigation of Handling Qualities Requirements for Helicopter Instrument Flight During Decelerating Approach Manoeuvres and Overshoot</b> (Stan Kereliuk, J. Murray Morgan)
FAA-RD-80-87	<b>Preliminary Test Plans for ATC Concepts for Longer Term Improvements, Helicopter Operations Development Program</b> (D. James Freund, Tirey K. Vickers) (NTIS: ADA 089 407)

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FAA-RD-76-100      **Progress Toward Development of Civil**  
NASA TM X-73,124 **Airworthiness Criteria for Powered-Lift Aircraft**  
(Barry C. Scott, Charles S. Hynes,  
Paul W. Martin, Ralph B. Bryder)  
(NTIS: ADA 028 058)

FAA-RD-80-85      **Proposed ATC System for the Gulf of Mexico,**  
**Helicopter Operations Development Program**  
(D. James Freund, Tirey K. Vickers)  
(NTIS: ADA 089 430)

FAA/PM-86/52      **Operational Suitability of the Automated**  
FAA/CT-87/3 **Weather Observing System (AWOS) at Heliports**  
(Rene' A. Matos, Rosanne M. Weiss)  
(NTIS: ADA 179 296)

FAA-RD-80-86      **Recommendations for Short-Term Simulation of ATC**  
**Concepts, Helicopter Operations Development**  
**Program** (D. James Freund, Tirey K. Vickers)  
(NTIS: ADA 089 435)

FAA-RD-81-55      **Recommended Changes to ATC Procedures for**  
**Helicopters** (Glen A. Gilbert, Tirey K. Vickers)  
(NTIS: ADA 175 179)

FAA-RD-80-88      **Recommended Short-Term ATC Improvements for**  
**Helicopters** (Tirey K. Vickers, D.J. Freund)

Vol-I:      Summary of Short Term Improvements  
(NTIS: ADA 089 521)

Vol-II:      Recommended Helicopter ATC Training  
Material (NTIS: ADA 089 441)

Vol-III:      Operational Description of  
Experimental LORAN Flight Following in  
the Houston Area (NTIS: ADA 089 385)

AVSCOM 8412      **Report of Investigative Testing of Global**  
(1987) **Positioning System Slant Range Accuracy**  
(Captain Jeryl S. Cornell)

FAA/CT-82/152      **Review of Aircraft Crash Structural Response**  
**Research** (Emmett A. Witmer, David J. Steigmann)  
(NTIS: ADA 131 696)

FAA-RD-78-157      **Review of Airworthiness Standards for**  
**Certification of Helicopters for Instrument**  
**Flight Rules (IFR) Operations** (Joseph J.  
Traybar, David L. Green, Albert G. Delucien)  
(NTIS: ADA 068 397)

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FAA/DS-88/7	<b>Risk Management for Air Ambulance Helicopter Operators</b> (Richard J. Adams and Jack T. Thompson) (NTIS: ADA 212 662)
CERL TR N-85/14	<b>Role of Vibration and Rattle in Human Response to Helicopter Noise</b> (Paul D. Schomer, Robert D. Neathammer) (NTIS: ADA 162 486)
FAA/DS-89/9	<b>Rotorcraft Low Altitude CNS Benefit/Cost Analysis; Rotorcraft Operations Data</b> (Brian E. Mee, Deborah Peisen, Margaret B. Renton) (NTIS: ADA 214 113)
FAA/CT-TN85/83	<b>Rotorcraft TCAS Evaluation Bench Test Report</b> (Arthur W. Cushman, Albert J. Rehmann, John Warren)
FAA/CT-TN85/0	<b>Rotorcraft TCAS Evaluation, Group 1 Results</b> (Albert J. Rehmann)
FAA/CT-TN86/24	<b>Rotorcraft TCAS Evaluation, Group 2 Results</b> (Albert J. Rehmann) (NTIS: ADA 176 040)
FAA/CT-TN87/21	<b>Rotorcraft TCAS Evaluation, Group 3 Results</b> (Albert J. Rehmann) (NTIS: ADA 191 719)
FAA/CT-82/143	<b>Safety Benefits Analysis of General Aviation Cockpit Standardization</b> (Bruce E. Beddow, Sidney Berger, Charles E. Roberts, Jr.) (NTIS: ADA 123 537)
FAA/CT-TN86/40	<b>Signal Coverage and Characteristics of the Atlantic City Heliport MLS</b> (Barry R. Billmann, Donald W. Gallagher, Christopher Wolf, John Morrow, Scott B. Shollenberger, Paula Maccagnano) (NTIS: ADA 178 389)
115-608-3X (June 1962)	<b>Simulation Study of IFR Helicopter Operations in the New York Area</b> (A.L. Sluka, J.R. Bradley, D.W. Yongman, D.A. Martin and Franklin Institute Laboratories)
FAA/CT-TN87/4	<b>Simulation Tests of Proposed Instrument Approach Lighting Systems for Helicopter Operations</b> (Paul H. Jones)

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FAA/PM-86/30 FAA/CT-86-9	<b>Siting, Installation, and Operational Suitability of the Automated Weather Observing System (AWOS) at Heliports</b> (Rene' A. Matos, John R. Sackett, Philip Shuster, Rosanne M. Weiss) (NTIS: ADA 175 232)
FAA/CT-85/7	<b>State-of-The-Art Review on Composite Material Fatigue/Damage Tolerance</b> (Regional L. Amory, David S. Wang) (NTIS: ADA 168 820)
RD-64-4	<b>State-of-the-Art Survey for Minimum Approach, Landing and Takeoff Intervals as Dictated by Wakes, Vortices, and Weather Phenomena</b> (W.J. Bennett) (NTIS: AD 436 746)
FAA/CT-86/42	<b>Statistics on Aircraft Gas Turbine Engine Rotor Failures that Occurred in U.S. Commercial Aviation During 1981</b> (Robert A. DeLucia, James T. Salvina, Tracy Russo) (NTIS: ADA 181 930)
FAA/CT-88/23	<b>Statistics on Aircraft Gas Turbine Engine Rotor Failures that Occurred in U.S. Commercial Aviation During 1982</b> (Robert A. Delucia, James T. Salvino) (NTIS: ADA 199 002)
FAA/CT-89/5	<b>Statistics on Aircraft Gas Turbine Engine Rotor Failures that Occurred in U.S. Commercial Aviation During 1983</b> (R.A. DeLucia, J.T. Salvino) (NTIS: ADA 207 592)
FAA/CT-89/6	<b>Statistics on Aircraft Gas Turbine Engine Rotor Failures that Occurred in U.S. Commercial Aviation During 1984</b> (Robert A. DeLucia, James T. Salvino, Bruce C. Fenton) (NTIS: ADA 212 745)
FAA/CT-89/7	<b>Statistics on Aircraft Gas Turbine Engine Rotor Failures that Occurred in U.S. Commercial Aviation During 1985</b> (Robert A. DeLucia, James T. Salvino, Bruce C. Fenton) (NTIS: ADA 212 664)
FAA/CT-89/30	<b>Statistics on Aircraft Gas Turbine Engine Rotor Failures that Occurred in U.S. Commercial Aviation During 1986</b> (Robert A. DeLucia, James T. Salvino, Bruce C. Fenton) (NTIS: ADA 220 129)
FAA/PM-84/23	<b>Structural Design Guidelines for Heliports</b> (Charles W. Schwartz, Matthew W. Witczak, Rita B. Leahy) (NTIS: ADA 148 967)

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FAA-EE-80-5	<b>Study of Cost/Benefit Tradeoffs Available in Helicopter Noise Technology Applications</b> (R.H. Spencer, H. Sternfeld, Jr.) (NTIS: ADA 083 955)
FAA/CT-86/24	<b>Study of General Aviation Fire Accidents (1974-1983)</b> (Ludwig Benner Jr., Richard Clarke, Russell Lawton) (NTIS: ADA 180 472)
FAA-RD-80-58	<b>Study of Helicopter Performance and Terminal Instrument Procedures</b> (Albert G. DeLucien, David L. Green, H.R. Price, F.D. Smith) (NTIS: ADA 090 052)
FAA-RD-80-107	<b>Study of Heliport Airspace and Real Estate Requirements</b> (Albert G. DeLucien, F.D. Smith) (NTIS: ADA 091 156)
FAA-RD-77-100	<b>Study to Improve Turbine Engine Rotor Blade Containment</b> (K.F. Heermann, R.H. Eriksson, K.R. McClure) (NTIS: ADA 045 314)
FAA/CT-85/26	<b>Summary of Artificial and Natural Icing Tests Conducted on U.S. Army Aircraft from 1974 to 1985</b> (Harry W. Chambers, John Y. Adams) (NTIS: ADA 173 764)
FAA-RD-74-48 FAA-NA-73-68	<b>Summary of Helicopter Vorticity and Wake Turbulence Publications with an Annotated Bibliography</b> (Jack J. Shrager) (NTIS: AD 780 053)
FAA/CT-83/40	<b>Survey of Characteristics of Near Mid-Air Collisions Involving Helicopters</b> (Barry R. Billmann) (NTIS: ADA 134 425)
FAA-EE-82-20	<b>Survey of Helicopter and Ambient Urban Noise Levels in Phoenix, Arizona</b> (J. Stephen Newman) (NTIS: ADA 123 856)
NA-80-34-LR	<b>Survey of Heliport Lighting and Marking Systems</b> (Thomas H. Paprocki)
FAA/PM-85/29	<b>TCAS Surveillance Performance in Helicopters</b> (William H. Harman, Jerry D. Welch, M. Loren Wood) (NTIS: ADA 181 349)
FAA/PM-86/14 NASA CR-177407	<b>Technical Requirements for Benchmark Simulator-Based Terminal Instrument Procedures (TERPS) Evaluation</b> (Anil V. Phatak, John A. Sorensen) (NTIS: ADA 169 947)

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FAA/CT-TN85/58      **Technical Support of the Wall Street/Battery Park City Heliport MLS Project** (Barry R. Billmann, Michael M. Webb, James H. Enias) (NTIS: ADA 165 073)

FAA-CT-81-167      **Terminal Helicopter Instrument Procedures (TERPS)** (Robert H. Pursel)

FAA-RD-79-123      **Test and Evaluation of Air/Ground Communications for Helicopter Operations in the Offshore New Jersey, Baltimore Canyon Oil Exploration Area** (James J. Coyle) (NTIS: ADA 082 026)

FAA-NA-79-22

FAA/CT-TN87/16      **Test Plan for Helicopter GPS Applications** (Michael Magrogan) (NTIS: ADA 183 299)

FAA/CT-TN88/19      **Test Plan for Helicopter Visual Segment Approach Lighting System** (Scott B. Schollenberger, Barry R. Billmann)

FAA/CT-TN85/49      **Test Plan for Rotorcraft Traffic Alert and Collision Avoidance System (TCAS)** (Albert J. Rehmann)

FAA/CT-TN85/23      **Test Plan for Siting, Installation, and Operational Suitability of the AWOS at Heliports** (Rene' A. Matos)

FAA-RD-81-7-LR      **Three Cue Helicopter Flight Directors: An Annotated Bibliography** (Tosh Pott, J.P. McVicker, Herbert W. Schlickemaier)

FAA/RD-82/16      **(Three) 3D LORAN-C Navigation Documentation** (Eric H. Bolz, Larry D. King) (NTIS: ADA 120 106)

FAA/PM-85/29      **Traffic Alert and Collision System (TCAS) Surveillance Performance in Helicopters** (William H. Harman, Jerry D. Welch, M. Loren Wood) (NTIS: ADA 181 349)

FAA/CT-82/115      **Validation of Digital Systems in Avionics and Flight Control Applications, Handbook - Volume I**, (Ellis F. Hilt, Donald Eldredge, Jeff Webb, Charles Lucius, Michael S. Bridgman) (NTIS: ADA 176 077) (Volume II was published as FAA/CT-88/10)

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FAA/CT-TN85/53	<b>Validation of MLS Siting Criteria for MLS Steep Angle Approaches to a Heliport</b> (Scott Shollenberger)
FAA/PM-84/31	<b>Very Short Range Statistical Forecasting of Automated Weather Observations</b> (Robert G. Miller) (NTIS: ADA 149 539)
FAA/PM-86/10	<b>Very Short Range Statistical Forecasting of Automated Weather Observations</b> (Robert G. Miller) (NTIS: ADA 167 049)
FAA/PM-87/2	<b>Very Short Range Statistical Forecasting of Automated Weather Observations</b> (Robert G. Miller) (NTIS: ADA 179 104)
FAA/PS-88/3	<b>Very Short Range Statistical Forecasting of Automated Weather Observations</b> (Robert G. Miller) (NTIS: ADA 190 803)
FAA/PM-85/8	<b>VHF-AM Communications Equipment, Selection and Installation Practices for Helicopters</b> (Eric H. Bolz, Larry D. King) (NTIS: ADA 163 483)
RD-66-46	<b>VORTAC Error Analysis for Helicopter Navigation, New York City Area</b> (Ronald Braff) (NTIS: AD 643 257)
FAA-RD-75-125	<b>V/STOL Aircraft Noise Predictions</b> (Jet Propulsors) (N.N. Reddy, D.F. Blakney, J.G. Tibbets, J.S. Gibson) (NTIS: ADA 028 765)
RD-66-68	<b>V/STOL Approach System Steep Angle Flight Tests</b> (Glen D. Adams) (NTIS: AD 646 236)
FAA-RD-73-145	<b>V/STOL Noise Prediction and Reduction</b> (Wiley A. Guinn, Dennis F. Blakney, John S. Gibson) (NTIS: AD 774 794)
FAA-RD-76-49	<b>V/STOL Rotary Propulsion Systems - Noise Prediction and Reduction</b> (B. Magliozzi)
	Vol-I: Identification of Sources, Noise Generating Mechanisms, Noise Reduction Mechanisms, and Prediction Methodology (NTIS: ADA 027 389)
	Vol-II: Graphical Prediction Methods (NTIS: ADA 027 390)
	Vol-III: Computer Program User's Manual (NTIS: ADA 027 363)

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FAA-RD-79-107      **V/STOL Rotary Propulsor Noise Prediction Model  
Update and Evaluation (B. Magliozzi)**  
(NTIS: ADA 082 616)

RD-67-68            **VTOL and STOL Simulation Study**  
NA-68-21            (Robert C. Conway) (NTIS: AD 670 006)

FAA/RD-81/92        **Weather Deterioration Models Applied to  
Alternate Airport Criteria (Edwin D. McConkey)**  
(NTIS: ADA 108 877)

FAA-RD-75-94        **Wind and Turbulence Information for Vertical and  
Short Take-Off and Landing (V/STOL) Operations  
in Built-Up Urban Areas-Results of  
Meteorological Survey (J.V. Ramsdell)**  
(NTIS: ADA 019 216)

FAA-RD-79-64        **Workload and the Certification of Helicopters  
for IFR Operations (Albert G. Delucien, David L.  
Green, Steven W. Jordan, Joseph J. Traybar)**  
(NTIS ADA 072 758)

FAA/DS-88/2         **"Zero/Zero" Rotorcraft Certification Issues**  
FAA/PS-88/8         (Richard J. Adams)

NASA CR 177483

Vol-I:            Executive Summary (NTIS: N88-25453)  
Vol-II:           Plenary Session Presentations  
                  (NTIS: N88-25454)  
Vol-III:          Working Group Results  
                  (NTIS: N88-25455)

FAA/RD-82/16        **3D LORAN-C Navigation Documentation**  
(Eric H. Bolz, Larry D. King)  
(NTIS: ADA 120 106)

**APPENDIX B: CHRONOLOGICAL LISTING OF REPORT TITLES**

155-608-3X (June 1962)	<b>A Simulation Study of IFR Helicopter Operations in the New York Area</b> (A.L. Sluka, J.R. Bradley, D.W. Yongman, D.A. Martin and Franklin Institute Laboratories)
RD-64-4	<b>State-of-the-Art Survey for Minimum Approach, Landing and Takeoff Intervals as Dictated by Wakes, Vortices, and Weather Phenomena</b> (W.J. Bennett) (NTIS: AD 436 746)
RD-64-55	<b>Analytical Determination of the Velocity Fields in the Wakes of Specified Aircraft</b> (W.J. Bennett) (NTIS: AD 607 251)
RD-66-46	<b>VORTAC Error Analysis for Helicopter Navigation, New York City Area</b> (Ronald Braff) (NTIS: AD 643 257)
RD-66-68	<b>V/STOL Approach System Steep Angle Flight Tests</b> (Glen D. Adams) (NTIS: AD 646 236)
NA-67-1 DS-67-23	<b>An Analysis of the Helicopter Height Velocity Diagram Including a Practical Method for its Determination</b> (William J. Hanley, Gilbert Devore) (NTIS: AD 669 481)
RD-67-36	<b>Economic and Technical Feasibility Analysis of Establishing an All-Weather V/STOL Transportation System</b> (Joseph M. Del Balzo) (NTIS: AD 657 330)
RD-67-68 NA-68-21	<b>VTOL and STOL Simulation Study</b> (Robert C. Conway) (NTIS: AD 670 006)
NA-69-2 RD-68-61	<b>Flight Test and Evaluation of Heliport Lighting for VFR</b> (Richard L. Sulzer, Thomas H. Paprocki) (NTIS: AD 683 680)
FAA-RD-70-10 FAA-NA-70-7	<b>Evaluation of LORAN-C/D Airborne Systems</b> (George H. Quinn) (NTIS: AD 705 507)
FAA-RD-71-96 FAA-NA-71-45	<b>Analytical Study of the Adequacy of VOR/DME and DME/DME Guidance Signals for V/STOL Area Navigation in the Los Angeles Area</b> (Bernhart V. Dinerman) (NTIS: AD 735 399)
FAA-RD-71-105	<b>Heliport Beacon Design, Construction, and Testing</b> (Fred Walter) (NTIS: AD 745 514)

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FAA-NA-72-39	<b>Index of NAFEC Technical Reports, 1967-1971</b> (NTIS: AD 742 849)
FAA-NA-72-41	<b>Collision Avoidance: An Annotated Bibliography, September 1968 --- April 1972</b> (Dorothy E. Bulford) (NTIS: AD 746 863)
FAA-RD-72-133 FAA-NA-72-89	<b>Flight Test and Evaluation of Heliport Lighting for IFR</b> (Thomas H. Paprocki) (NTIS: AD 753 058)
FAA-EM-73-8	<b>Civil Aviation Midair Collisions Analysis, January 1964 - December 1971</b> (T.R. Simpson, R.A. Rucker, J.P. Murray) (NTIS: AD 766 900)
FAA-EM-73-8 Addendum 1	<b>Civil Aviation Midair Collisions Analysis, 1972 Added to 1964-1971 Results</b> (R.A. Rucker, T.R. Simpson) (NTIS: ADA 005 897)
FAA-RD-73-47 FAA-NA-72-95	<b>ATC Concepts for V/STOL Vehicles, Parts 1 and 2</b> (Sidney B. Rossiter, John Maurer, Paul J. O'Brien) (NTIS: AD 759 864)
FAA-RD-73-145	<b>V/STOL Noise Prediction and Reduction</b> (Wiley A. Guinn, Dennis F. Blakney, John S. Gibson) (NTIS: AD 774 794)
FAA-RD-74-48 FAA-NA-73-68	<b>A Summary of Helicopter Vorticity and Wake Turbulence Publications with an Annotated Bibliography</b> (Jack J. Shrager) (NTIS: AD 780 053)
FAA-RD-75-79	<b>A Comprehensive Review of Helicopter Noise Literature</b> (B. Magliozzi, F.B. Metzger, W. Bausch, R.J. King) (NTIS: ADA 014 640)
FAA-RD-75-94	<b>Wind and Turbulence Information for Vertical and Short Take-Off and Landing (V/STOL) Operations in Built-Up Urban Areas-Results of Meteorological Survey</b> (J.V. Ramsdell) (NTIS: ADA 019 216)
FAA-RD-75-125	<b>V/STOL Aircraft Noise Predictions (Jet Propulsors)</b> (N.N. Reddy, D.F. Blakney, J.G. Tibbets, J.S. Gibson) (NTIS: ADA 028 765)

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- FAA-RD-75-190      **Noise Certification Criteria and Implementation Considerations for V/STOL Aircraft**  
(MAN-Acoustics and Noise, Inc.)  
(NTIS: ADA 018 036)
- FAA-RD-76-1      **Human Response to Sound: The Calculation of Perceived Level, PLdB (Noisiness or Loudness) Directly From Physical Measures**  
(Thomas H. Higgins) (NTIS: ADA 035 677)
- FAA-RD-76-49      **V/STOL Rotary Propulsion Systems - Noise Prediction and Reduction (B. Magliozzi)**
- Vol-I:      Identification of Sources, Noise Generating Mechanisms, Noise Reduction Mechanisms, and Prediction Methodology  
(NTIS: ADA 027 389)
- Vol-II:      Graphical Prediction Methods  
(NTIS: ADA 027 390)
- Vol-III:      Computer Program User's Manual  
(NTIS: ADA 027 363)
- FAA-RD-76-100      **Progress Toward Development of Civil**  
NASA TM X-73,124 **Airworthiness Criteria for Powered-Lift Aircraft**  
(Barry C. Scott, Charles S. Hynes,  
Paul W. Martin, Ralph B. Bryder)  
(NTIS: ADA 028 058)
- FAA-RD-76-116      **Noise Certification Considerations for Helicopters Based on Laboratory Investigations**  
(MAN-Acoustics and Noise) (NTIS: ADA 032 028)
- FAA-RD-76-146      **A Comparison of Air Radionavigation Systems (For Helicopters In Off-Shore Areas)**  
(George H. Quinn) (NTIS: ADA 030 337)
- FAA-EM-77-15      **Bibliography: Airports (Transportation Research Board)** (NTIS: ADA 049 879)
- FAA-RD-77-57      **Helicopter Noise Measurements Data Report**  
(Harold C. True, Richard M. Letty)
- Vol-I:      Helicopter Models: Hughes 300-C,  
Hughes 500-C, Bell 47-G, Bell 206-L  
(NTIS: ADA 040 561)
- Vol-II:      Helicopter Models: Bell 212 (UH-1N),  
Sikorsky S-61 (SH-3A), Sikorsky S-64  
"Skycrane" CH-54B, Boeing Vertol  
"Chinook" (CH-47C) (NTIS: ADA 040 562)

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FAA-RD-77-94      **Noise Characteristics of Eight Helicopters**  
(Harold C. True, E.J. Rickley)  
(NTIS: ADA 043 842)

FAA-RD-77-100     **Study to Improve Turbine Engine Rotor Blade**  
**Containment** (K.F. Heermann, R.H. Eriksson,  
K.R. McClure) (NTIS: ADA 045 314)

NA-78-55-LR       **Limited Test of LORAN-C and Omega for Helicopter**  
**Operations in the Offshore New Jersey Area**  
(Robert H. Pursel)

FAA-RD-78-101     **Helicopter Operations Development Plan**  
(NTIS: ADA 061 921)

FAA-RD-78-143     **Aircraft Wake Vortex Takeoff Tests at Toronto**  
**International Airport** (Thomas Sullivan,  
James Hallock, Berl Winston, Ian McWilliams,  
David C. Burnham) (NTIS: ADA 068 925)

FAA-RD-78-150     **Helicopter Air Traffic Control Operations**  
(NTIS: ADA 072 793)

FAA-RD-78-157     **Review of Airworthiness Standards for**  
**Certification of Helicopters for Instrument**  
**Flight Rules (IFR) Operations** (Joseph J.  
Traybar, David L. Green, Albert G. Delucien)  
(NTIS: ADA 068 397)

FAA-EE-79-03       **Noise Levels and Flight Profiles of Eight**  
**Helicopters Using Proposed International**  
**Certification Procedures** (J. Steven Newman,  
Edward J. Rickley) (NTIS: ADA 074 532)

FAA-AEE-79-13      **Assessment of the Environmental Compatibility of**  
**Differing Helicopter Noise Certification**  
**Standards** (Richard G. Edwards, Alvin B.  
Broderson, Roger W. Barbour, Donald F. McCoy,  
Charles W. Johnson) (NTIS: ADA 080 525)

FAA-RD-79-59       **Powered-Lift Aircraft Handling Qualities in the**  
**Presence of Naturally-Occurring and Computer-**  
**Generated Atmospheric Disturbances** (Wayne F.  
Jewell, Warren F. Clement, Thomas C. West,  
Dr. S.R.M. Sinclair) (NTIS: ADA 072 118)

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FAA-RD-79-64	<b>Workload and the Certification of Helicopters for IFR Operations</b> (Albert G. Delucien, David L. Green, Steven W. Jordan, Joseph J. Traybar) (NTIS ADA 072 758)
FAA-RD-79-99	<b>Airborne Radar Approach System Flight Test Experiment</b> (Larry D. King, Richard J. Adams) (NTIS: ADA 077 900)
FAA-RD-79-107	<b>V/STOL Rotary Propulsor Noise Prediction Model Update and Evaluation</b> (B. Magliozzi) (NTIS: ADA 082 616)
FAA-RD-79-123 FAA-NA-79-22	<b>Test and Evaluation of Air/Ground Communications for Helicopter Operations in the Offshore New Jersey, Baltimore Canyon Oil Exploration Area</b> (James J. Coyle) (NTIS: ADA 082 026)
FAA-EE-80-5	<b>Study of Cost/Benefit Tradeoffs Available in Helicopter Noise Technology Applications</b> (R.H. Spencer, H. Sternfeld, Jr.) (NTIS: ADA 083 955)
FAA-RD-80-17 FAA-NA-80-13	<b>Northeast Corridor User Evaluation</b> (Joseph Harrigan) (NTIS: ADA 088 024)
FAA-RD-80-18 FAA-NA-80-8	<b>Flight Evaluation of a Radar Cursor Technique as an Aid to Airborne Radar Approaches</b> (Joseph Perez) (NTIS: ADA 084 015)
FAA-RD-80-20	<b>Helicopter Communications System Study</b> (Michael White, Dana Swann) (NTIS: ADA 182 703)
FAA-RD-80-22 FAA-NA-79-56	<b>Airborne Radar Approach</b> (Cliff Mackin) (NTIS: ADA 103 347)
FAA-RD-80-24	<b>Icing Characteristics of Low Altitude, Super Cooled Layer Clouds</b> (Richard K. Jeck) (NTIS: ADA 088 892)
FAA-AEE-80-34	<b>Helicopter Noise Exposure Level Data: Variations with Test Target</b> (J. Steven Newman) (NTIS: ADA 100 691)
NA-80-34-LR	<b>Survey of Heliport Lighting and Marking Systems</b> (Thomas H. Paprocki)
FAA-EE-80-41	<b>Helicopter Noise Contour Development Techniques and Directivity Analysis</b> (J. Steven Newman) (NTIS: ADA 093 426)

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FAA-EE-80-42	<b>Correlation of Helicopter Noise Levels with Physical and Performance Characteristics</b> (J. Stephen Newman) (NTIS: ADA 093 428)
FAA-RD-80-47 FAA-CT-80-18	<b>Flight Test Investigation of LORAN-C for En Route Navigation in the Gulf of Mexico</b> (Robert H. Pursel) (NTIS: ADA 091 637)
FAA-RD-80-58	<b>Study of Helicopter Performance and Terminal Instrument Procedures</b> (Albert G. DeLucien, David L. Green, H.R. Price, F.D. Smith) (NTIS: ADA 090 052)
FAA-RD-80-59	<b>Helicopter Terminal Instrument Procedures (TERPS) Development Program</b> (NTIS: ADA 088 150)
FAA-RD-80-60	<b>Airborne Radar Approach Flight Test Evaluating Various Track Orientation Techniques</b> (Larry D. King) (NTIS: ADA 088 426)
FAA-RD-80-64 NASA TM-81188	<b>A Piloted Simulator Investigation of Static Stability and Stability/Control Augmentation Effects on Helicopter Handling Qualities for Instrument Approach</b> (J. Victor Lebacqz, R.D. Forrest, R.M. Gerdes) (NTIS: ADA 093 654)
FAA-RD-80-80	<b>Helicopter Northeast Corridor Operational Test Support</b> (Glen A. Gilbert) (NTIS: ADA 088 151)
FAA-RD-80-85	<b>Proposed ATC System for the Gulf of Mexico, Helicopter Operations Development Program</b> (D. James Freund, Tirey K. Vickers) (NTIS: ADA 089 430)
FAA-RD-80-86	<b>Recommendations for Short-Term Simulation of ATC Concepts, Helicopter Operations Development Program</b> (D. James Freund, Tirey K. Vickers) (NTIS: ADA 089 435)
FAA-RD-80-87	<b>Preliminary Test Plans for ATC Concepts for Longer Term Improvements, Helicopter Operations Development Program</b> (D. James Freund, Tirey K. Vickers) (NTIS: ADA 089 407)

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FAA-RD-80-88      **Recommended Short-Term ATC Improvements for Helicopters** (Tirey K. Vickers, D.J. Freund)

Vol-I:      Summary of Short Term Improvements (NTIS: ADA 089 521)

Vol-II:      Recommended Helicopter ATC Training Material (NTIS: ADA 089 441)

Vol-III:      Operational Description of Experimental LORAN-C Flight Following (LOFF) in the Houston Area (NTIS: ADA 089 385)

FAA-RD-80-107      **Study of Heliport Airspace and Real Estate Requirements** (Albert G. DeLucien, F.D. Smith) (NTIS: ADA 091 156)

FAA-CT-80-175      **LORAN-C Non-Precision Approaches in the Northeast Corridor** (Frank Lorge)

FAA-CT-80-198      **Helicopter Air/Ground Communications** (James Coyle)

FAA-CT-80-210      **Helicopter Icing Review** (A.A. Peterson, L.U. Dadone) (NTIS: ADA 094 175)

FAA-EE-81-4      **A Comprehensive Bibliography of Literature on Helicopter Noise Technology** (A.M. Carter, Jr.) (NTIS: ADA 103 331)

FAA-RD-81-7-LR      **Three Cue Helicopter Flight Directors: An Annotated Bibliography** (Tosh Pott, J.P. McVicker, Herbert W. Schlickemaier)

FAA-RD-81-9      **Impact of Low Altitude Coverage Requirements on Air-Ground Communications** (B. Magenheimer) (NTIS: ADA 101 642)

FAA-EE-81-10      **Impact of Prediction Accuracy on Costs - Noise Technology Applications in Helicopters** (R.H. Spencer, H. Sternfeld, Jr.) (NTIS: ADA 101 768)

FAA-EE-81-13      **Helicopter Noise Analysis - Round Robin Test** (Edward J. Rickley) (NTIS: ADA 103 724)

FAA-EE-81-16      **Helicopter Noise Definition Report: UH-60A, S-76, A-109, 206-L** (J. Steven Newman, Edward J. Rickley, David W. Ford) (NTIS: ADA 116 363)

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FAA-RD-81-27 FAA-CT-80-53	<b>Flight Evaluation of LORAN-C as a Helicopter Navigation Aid in the Baltimore Canyon Oil Exploration Area</b> (William A. Lynn) (NTIS: ADA 105 260)
FAA/CT-81/35	<b>National Icing Facilities Requirements Investigation</b> (Frank R. Taylor, Richard J. Adams) (NTIS: ADA 102 520)
FAA/RD-81/35	<b>Development of a Heliport Classification Method and an Analysis of Heliport Real Estate and Airspace Requirements</b> (F.D. Smith, Albert G. Delucien) (NTIS: ADA 102 521)
FAA/RD-81/40	<b>Improved Weather Services for Helicopter Operations in the Gulf of Mexico</b> (Arthur Hilsenrod) (NTIS: ADA 102 209)
FAA-CT-81-54	<b>Index of National Aviation Facilities Experimental Center Technical Reports, 1972-1977</b> (Ruth J. Farrell, Nancy G. Boylan) (NTIS: ADA 104 759)
FAA-RD-81-55	<b>Recommended Changes to ATC Procedures for Helicopters</b> (Glen A. Gilbert, Tirey K. Vickers) (NTIS: ADA 175 179)
FAA-RD-81-59	<b>Helicopter Area Air Traffic Control Demonstration Plan</b> (Tirey K. Vickers, D. James Freund) (NTIS: ADA 174 973)
FAA/RD-81/92	<b>Weather Deterioration Models Applied to Alternate Airport Criteria</b> (Edwin D. McConkey) (NTIS: ADA 108 877)
FAA-CT-81-167	<b>Terminal Helicopter Instrument Procedures (TERPS)</b> (Robert H. Pursel)
FAA-CT-81-180	<b>Engineering and Development Program Plan, Helicopter Icing Technology Research</b> (NTIS: ADA 182 546)
FAA/RD-82/6	<b>Instrument Approach Aids for Helicopter</b> (Edwin D. McConkey, Ronald E. Ace) (NTIS: ADA 120 678)
FAA/RD-82/7 FAA/CT-81/72	<b>Flight Test Investigation of Area Calibrated LORAN-C for En Route Navigation in the Gulf of Mexico</b> (John G. Morrow) (NTIS: ADA 121 169)

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FAA/RD-82/8 FAA/CT-81/73	<b>Initial FAA Tests on the Navigation System Using Time and Ranging Global Positioning System Z-Set Receiver</b> (Robert J. Esposito) (NTIS: ADA 119 289)
FAA/RD-82/9 FAA/CT-81/75	<b>FAA Acceptance Tests on the Navigation System Using Time and Ranging Global Positioning System Z-Set Receiver</b> (Robert J. Esposito) (NTIS: ADA 119 306)
FAA-EE-82-16	<b>Helicopter Noise Exposure Curves for Use in Environmental Impact Assessment</b> (J. Steven Newman, Edward J. Rickley, Tyrone L. Bland) (NTIS: ADA 123 467)
FAA/RD-82/16	<b>3D LORAN-C Navigation Documentation</b> (Eric H. Bolz, Larry D. King) (NTIS: ADA 120 106)
FAA-EE-82-20	<b>A Survey of Helicopter and Ambient Urban Noise Levels in Phoenix, Arizona</b> (J. Stephen Newman) (NTIS: ADA 123 856)
FAA/RD-82/24 FAA/CT-82/32	<b>LORAN-C En Route Accuracies in the Central Appalachian Region</b> (Frank Lorge) (NTIS: ADA 123 465)
FAA/RD-82/40	<b>Application of the MLS to Helicopter Operations</b> (Edwin D. McConkey, John B. McKinley, Ronald E. Ace) (NTIS: PB-84 116458)
FAA/CT-82/57	<b>Northeast Corridor Helicopter Area Navigation Accuracy Evaluation</b> (Jack D. Edmonds) (NTIS: ADA 117 445)
FAA/kD-82/63	<b>EMC Analysis of a Prototype Civil-Use GPS Receiver on Four Aircraft Configurations</b> (Robert L. Mullen) (NTIS: ADA 119 578)
FAA/RD-82/71 FAA/CT-82/64	<b>Global Positioning System En Route/Terminal Exploratory Test</b> (Jerome T. Connor, Robert J. Esposito, Philip Lizzi) (NTIS: ADA 125 459)
FAA/RD-82/78 FAA/CT-82/76	<b>LORAN-C Nonprecision Approaches in the Northeast Corridor</b> (Frank Lorge) (NTIS: ADA 131 034)

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FAA/CT-82/103	<b>Flight Test Route Structure Statistics of Helicopter GPS Navigation with the Magnavox Z-Set</b> (Robert D. Till)
FAA/CT-82/115	<b>Handbook - Volume I, Validation of Digital Systems in Avionics and Flight Control Applications</b> (Ellis F. Hilt, Donald Eldredge, Jeff Webb, Charles Lucius, Michael S. Bridgman) (NTIS: ADA 176 077) (Volume II was published as FAA/CT-88/10)
FAA/CT-82/120	<b>All Weather Heliport</b> (Paul H. Jones)
FAA/CT-82/143	<b>Safety Benefits Analysis of General Aviation Cockpit Standardization</b> (Bruce E. Beddow, Sidney Berger, Charles E. Roberts, Jr.) (NTIS: ADA 123 537)
FAA/CT-82/152	<b>Review of Aircraft Crash Structural Response Research</b> (Emmett A. Witmer, David J. Steigmann) (NTIS: ADA 131 696)
FAA-EE-83-2	<b>Helicopter Noise Survey at Selected New York City Heliports</b> (E.J. Rickley, M.J. Brien, Steven R. Albersheim) (NTIS: ADA 129 167)
FAA/CT-TN83/03	<b>Helicopter Global Positioning System Navigation with the Magnavox Z-Set</b> (Robert D. Till)
FAA/PM-83/4	<b>Alaska LORAN-C Flight Test Evaluation</b> (Larry D. King, Edwin D. McConkey) (NTIS: ADA 123 633)
FAA-EE-83-5	<b>Helicopter Noise Survey Performed at Parker Center, Pasadena, and Anaheim California on February 10-14, 1983</b> (Steven R. Albersheim) (NTIS: ADA 130 962)
FAA-EE-83-6	<b>Helicopter Noise Survey Conducted at Norwood, Massachusetts on April 27, 1983</b> (Steven R. Albersheim) (NTIS: ADA 131 053)
FAA/CT-83/6	<b>General Aviation Safety Research Issues</b> (Robert J. Ontiveros) (NTIS: ADA 130 074)
FAA/CT-83/7	<b>Engineering and Development Program Plan, Aircraft Icing</b>

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FAA/CT-83/21 NRL Report 8738	<b>A New Data Base of Supercooled Cloud Variables for Altitudes up to 10,000 Feet AGL and the Implications for Low Altitude Aircraft Icing</b> (Richard K. Jeck) (NTIS: ADA 137 589)
FAA/CT-83/22	<b>A New Characterization of Supercooled Clouds Below 10,000 Feet AGL</b> (Charles O. Masters) (NTIS: ADA 130 946)
FAA/PM-83-32	<b>Conus LORAN-C Error Budget: Flight Test</b> (Larry D. King, Kristen J. Venezia, Edwin D. McConkey) (NTIS: ADA 140 264)
FAA/CT-83/40	<b>Survey of Characteristics of Near Mid-Air Collisions Involving Helicopters</b> (Barry R. Billmann) (NTIS: ADA 134 425)
FAA/CT-TN83/50 and Addendum 1	<b>Altitude Aided GPS</b> (George Paolacci)
FAA-EE-84-1	<b>Noise Measurement Flight Test for the Bell 222 Twin Jet Helicopter: Data and Analyses</b> (J. Steven Newman, Edward J. Rickley, Tyrone L. Bland, Sharon A. Daboin) (NTIS: ADA 139 906)
FAA-EE-84-2	<b>Noise Measurement Flight Test for Aerospatiale SA 354N Dauphin 2 Twin Jet Helicopter: Data and Analyses</b> (J. Steven Newman, Edward J. Rickley, Sharon A. Daboin, Kristy R. Beattie) (NTIS: ADA 143 229)
FAA-EE-84-3	<b>Noise Measurement Flight Test for Hughes 500D/E: Data and Analyses</b> (J. Steven Newman, Edward J. Rickley, Kristy R. Beattie, Tyrone L. Bland) (NTIS: ADA 148 110)
FAA-EE-84-04	<b>Noise Measurement Flight Test for Aerospatiale AS 355F TwinStar Helicopter: Data/Analyses</b> (J. Steven Newman, Edward J. Rickley, Kristy R. Beattie, Tyrone L. Bland) (NTIS: ADA 147 497)
FAA-EE-84-05	<b>Noise Measurement Flight Test for Aerospatiale AS 350D AStar Helicopter: Data and Analyses</b> (J. Steven Newman, Edward J. Rickley, Kristy R. Beattie, Tyrone L. Bland) (NTIS: ADA 148 496)

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FAA-EE-84-6	<b>Noise Measurement Flight Test for Sikorsky S-76A Helicopter: Data and Analyses</b> (J. Steven Newman, Edward J. Rickley, Tyrone L. Bland, Kristy R. Beattie) (NTIS: ADA 148 525)
FAA-EE-84-7	<b>Noise Measurement Flight Test for Boeing Vertol 234/CH 47-D Helicopter: Data/Analyses</b> (J. Steven Newman, Edward J. Rickley, Tyrone L. Bland, Kristy R. Beattie) (NTIS: ADA 148 172)
FAA-EE-84-15	<b>Helicopter Noise Survey Performed at Las Vegas, Nevada, January 19-21, 1984</b> (Steven R. Albersheim) (NTIS: ADA 147 392)
FAA/CT-TN84/16	<b>Helicopter MLS (Collocated) Flight Test Plan to Determine Optimum Course Width</b> (James H. Enias)
FAA/CT-TN84/20	<b>Helicopter MLS Collocated Flight Test for TERPS Data</b> (James H. Enias, Paul Maenza, Donald P. Pate)
FAA/PM-84/22	<b>Heliport Snow and Ice Control, Methods and Guidelines</b> (John B. McKinley, Robert B. Newman) (NTIS: ADA 148 137)
FAA/PM-84/23	<b>Structural Design Guidelines for Heliports</b> (Charles W. Schwartz, Matthew W. Witczak, Rita B. Leahy) (NTIS: ADA 148 967)
FAA/PM-84/25	<b>Evaluating Wind Flow Around Buildings on Heliport Placement</b> (John B. McKinley) (NTIS: ADA 153 512)
FAA/PM-84/31	<b>Very Short Range Statistical Forecasting of Automated Weather Observations</b> (Robert G. Miller) (NTIS: ADA 149 539)
FAA/CT-TN84/34	<b>Helicopter IFR Lighting and Marking Preliminary Test Results</b> (Paul H. Jones)
FAA/CT-TN84/40	<b>Heliport MLS Siting Evaluation</b> (Scott B. Shollenberger)
FAA/CT-TN84/47	<b>Global Positioning System Performance During FAA Helicopter Tests on Rotor Effects</b> (Jerome T. Connor, George Paolacci)
PM-85-2-LR	<b>Heliport Design Guide, Workshop Report Vol I: Executive Summary</b>

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FAA-EE-85-3	<b>Helicopter Noise Survey for Selected Cities in the Contiguous United States</b> (Robert Main, Andrew Joshi, David Coutts, Leslie Hilten) (NTIS: ADA 154 893)
PM-85-3-LR	<b>Heliport Design Guide, Workshop Report Vol II: Appendixes</b>
PM-85-4-LR	<b>Heliport Design Guide, Workshop Report Vol III: Viewgraphs</b>
FAA/CT-TN85/5	<b>Gulf of Mexico Helicopter Loran C Stability Study</b> (Rosanne M. Weiss)
FAA-EE-85-6	<b>ICAO Helicopter Noise Measurement Repeatability Program, Bell 206L-1 Noise Measurement Flight Test</b> (J. Steven Newman, Maryalice Locke) (NTIS: ADA 159 898)
FAA/PM-85/6	<b>Helicopter User Survey: TCAS</b> (Frank R. Taylor, Richard J. Adams) (NTIS: ADA 155 415)
FAA/CT-85/7	<b>State-of-The-Art Review on Composite Material Fatigue/Damage Tolerance</b> (Regional L. Amory, David S. Wang) (NTIS: ADA 168 820)
FAA-EE-85-7	<b>Flight Operations Noise Tests of Eight Helicopters</b> (Sharon A. Yoshikami) (NTIS: ADA 159 835)
FAA/PM-85/7	<b>MLS for Heliport Operators, Owners, and Users</b> (Kristen J. Venezia, Edwin D. McConkey) (NTIS: ADA 157 367)
FAA/PM-85/8	<b>VHF-AM Communications Equipment, Selection and Installation Practices for Helicopters</b> (Eric H. Bolz, Larry D. King) (NTIS: ADA 163 483)
FAA/CT-85/11	<b>Analysis of Rotorcraft Crash Dynamics for Development of Improved Crashworthiness Design Criteria</b> (Joseph W. Coltman, Akif O. Bolukbasi, David H. Laananen) (NTIS: ADA 158 777)
FAA/CT-TN85/15	<b>Course Width Determination for Collocated MLS at Heliports</b> (James H. Enias)

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FAA/CT-TN85/17	<b>Nonprecision Approaches in the Northeast Corridor Using Second Generation Loran Receivers</b> (Barry Billmann, John G. Morrow, Christopher Wolf)
FAA/CT-TN85/23	<b>Test Plan for Siting, Installation, and Operational Suitability of the AWOS at Heliports</b> (Rene' A. Matos)
FAA/CT-TN85/24	<b>Helicopter Terminal Instrument Approach Procedures (VOR/ILS)</b> (Christopher Wolf)
FAA/CT-85/26	<b>Summary of Artificial and Natural Icing Tests Conducted on U.S. Army Aircraft from 1974 to 1985</b> (Harry W. Chambers, John Y. Adams) (NTIS: ADA 173 764)
FAA/PM-85/29	<b>Traffic Alert and Collision System (TCAS) Surveillance Performance in Helicopters</b> (William H. Harman, Jerry D. Welch, M. Loren Wood) (NTIS: ADA 181 349)
FAA/PM-85/30	<b>Pilot Evaluation of TCAS in the Long Ranger Helicopter</b> (John W. Andrews) (NTIS: ADA 169 076)
FAA/CT-TN85/43	<b>Helicopter MLS RNAV Development and Flight Test Project, Project Plan</b> (James H. Remer)
FAA/CT-TN85/49	<b>Test Plan for Rotorcraft Traffic Alert and Collision Avoidance System (TCAS)</b> (Albert J. Rehmann)
FAA/CT-TN85/53	<b>Validation of MLS Siting Criteria for MLS Steep Angle Approaches to a Heliport</b> (Scott Shollenberger)
FAA/CT-TN85/55	<b>Pilot Inflight Evaluation of MLS Procedures at Heliports</b> (James H. Enias)
FAA/CT-TN85/58	<b>Technical Support of the Wall Street/Battery Park City Heliport MLS Project</b> (Barry R. Billmann, Michael M. Webb, James H. Enias) (NTIS: ADA 165 073)
FAA/CT-TN85/60	<b>Rotorcraft TCAS Evaluation, Group 1 Results</b> (Albert J. Rehmann)

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FAA/CT-TN85/63	<b>Computed Centerline MLS Approach Demonstration at Washington National Airport</b> (James H. Remer) (NTIS: ADA 163 722)
FAA/CT-TN85/64	<b>Heliport MLS Critical Area Flight Tests</b> (Robert S. Jeter)
FAA/CT-TN85/83	<b>Rotorcraft TCAS Evaluation Bench Test Report</b> (Arthur W. Cushman, Albert J. Rehmann, John Warren)
NAE-AN-26 NRC No. 24173	<b>A Preliminary Investigation of Handling Qualities Requirements for Helicopter Instrument Flight During Decelerating Approach Manoeuvres and Overshoot</b> (Stan Kereliuk, J. Murray Morgan) February 1985
CERL TR N-85/14	<b>The Role of Vibration and Rattle in Human Response to Helicopter Noise</b> (Paul D. Schomer, Robert D. Neathammer) (NTIS: ADA 162 486)
FAA-EE-86-01	<b>Analysis of Helicopter Noise Using International Helicopter Certification Procedures</b> (J. Steven Newman, Edward J. Rickley, Dennis A. Levanowski, Susan B. Woolridge) (NTIS: ADA 167 446)
FAA-EE-86-04	<b>Noise Levels from Urban Helicopter Operations, New Orleans, Louisiana</b> (Steven R. Albersheim) (NTIS: ADA 174 129)
FAA/CT-86/8	<b>Determination of Electrical Properties of Grounding, Bonding and Fastening Techniques for Composite Materials</b> (William W. Cooley) (NTIS: ADA 182 744)
FAA/PM-86/10	<b>Very Short Range Statistical Forecasting of Automated Weather Observations</b> (Robert G. Miller) (NTIS: ADA 167 049)
FAA/CT-TN86/11	<b>Fluid Ice Protection Systems</b> (Larry Hackler, Ralph Rissmiller, Jr.)
FAA/CT-TN86/14	<b>Heliport MLS Flight Inspection Project</b> (Scott Shollenberger, Barry R. Billmann)
FAA/PM-86/14 NASA CR-177407	<b>Technical Requirements for Benchmark Simulator-Based Terminal Instrument Procedures (TERPS) Evaluation</b> (Anil V. Phatak, John A. Sorensen) (NTIS: ADA 169 947)

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FAA/PM-86/15 NASA CR-177408	<b>Evaluation of the Usefulness of Various Simulation Technology Options for Terminal Instrument Procedures (TERPS) Enhancements</b> (Anil V. Phatak, John A. Sorensen) (NTIS: ADA 169 893)
FAA/CT-TN86/17	<b>LORAN Offshore Flight Following Project Plan</b> (Jean Evans, Frank Lorge)
FAA/CT-TN86/22	<b>Heliport Electroluminescent (E-L) Lighting System, Preliminary Evaluation</b> (Paul H. Jones)
FAA/CT-86/24	<b>Study of General Aviation Fire Accidents (1974-1983)</b> (Ludwig Benner Jr., Richard Clarke, Russell Lawton) (NTIS: ADA 180 472)
FAA/CT-TN86/24	<b>Rotorcraft TCAS Evaluation, Group 2 Results</b> (Albert J. Rehmann) (NTIS: ADA 176 040)
FAA/PM-86/25	<b>Aircraft Avionics Suitable for Advanced Approach Applications</b> (Stanley Kowalski, Thomas H. Croswell) Volume I: Aircraft Fleet Equipage (NTIS: ADA 170 079)
FAA/PM-86/28	<b>Investigation of Hazards of Helicopter Operations and Root Causes of Helicopter Accidents</b> (Franklin R. Taylor, Rich J. Adams) (NTIS: ADA 171 994)
FAA/CT-TN86/30	<b>Evaluation of MLS for Helicopter Operations, Optimum Course Width Tailoring Flight Test Plan</b> (Michael M. Webb)
FAA/PM-86/30 FAA/CT-86-9	<b>The Siting, Installation, and Operational Suitability of the Automated Weather Observing System (AWOS) at Heliports</b> (Rene' A. Matos, John R. Sackett, Philip Shuster, Rosanne M. Weiss) (NTIS: ADA 175 232)
FAA/CT-TN86/31	<b>Evaluation of Sikorsky S-76A, 24 Missed Approach Profiles Following Precision MLS Approaches to a Helipad at 40 KIAS</b> (Michael M. Webb) (NTIS: ADA 175 407)
FAA/CT-86/35	<b>An Analytical Study of Icing Similitude for Aircraft Engine Testing</b> (C. Scott Bartlett) (NTIS: ADA 180 863)

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FAA/CT-TN86/40     **Signal Coverage and Characteristics of the Atlantic City Heliport MLS** (Barry R. Billmann, Donald W. Gallagher, Christopher Wolf, John Morrow, Scott B. Shollenberger, Paula Maccagnano) (NTIS: ADA 178 389)

FAA/PM-86/41     **Aeronautical Decision Making for Student and Private Pilots** (Alan E. Diehl, Peter V. Hwoschinsky, Gary S. Livack, Russell S. Lawton) (NTIS ADA 182 549)

FAA/CT-86/42     **Statistics on Aircraft Gas Turbine Engine Rotor Failures that Occurred in U.S. Commercial Aviation During 1981** (Robert A. DeLucia, James T. Salvina, Tracy Russo) (NTIS: ADA 181 930)

FAA/CT-TN86/42     **Heliport MLS Decelerating Test Plan** (Scott B. Schollenberger, Barry R. Billmann)

FAA/PM-86/42     **Aeronautical Decision Making for Commercial Pilots** (Richard S. Jensen, Janeen Adrion) (NTIS ADA 198 772)

FAA/PM-86/43     **Aeronautical Decision Making for Instrument Pilots** (Richard S. Jensen, Janeen Adrion, Russell S. Lawton) (NTIS ADA 186 112)

FAA/PM-86/44     **Aeronautical Decision Making for Instructor Pilots** (Georgette D. Buch, Russell S. Lawton, Gary S. Livack) (NTIS ADA 182 611)

FAA/PM-86/45     **Aeronautical Decision Making for Helicopter Pilots** (Richard J. Adams, Jack L. Thompson) (NTIS: ADA 180 325)

FAA/PM-86/46     **Aeronautical Decision Making - Cockpit Resource Management** (Richard S. Jensen) (NTIS: ADA 205 115)

FAA/PM-86/47     **FAA Helicopter/Heliport Research, Engineering, and Development Bibliography, 1964 - 1986** (Robert D. Smith) (NTIS: ADA 174 697)

FAA/PM-86/52  
FAA/CT-87/3     **The Operational Suitability of the Automated Weather Observing System (AWOS) at Heliports** (Rene' A. Matos, Rosanne M. Weiss) (NTIS: ADA 179 296)

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FAA/CT-TN86/56     **LORAN-C VNAV Approaches to the FAA Technical Center Heliport** (Michael Magrogan)  
(NTIS: ADA 182 152)

FAA/CT-TN86/61     **Heliport Visual Approach Surface Testing Test Plan** (Rosanne M. Weiss, John R. Sackett)  
(NTIS: ADA 179 897)

FAA/CT-TN86/63     **Helicopter Maneuvering: MLS Shuttle Holding Pattern Data Report** (Christopher J. Wolf, Raquel Y. Santana)

FAA/CT-TN86/64     **Heliport Critical Area Flight Test Results** (Barry R. Billmann, Michael M. Webb, John Morrow, Donald W. Gallagher, Christopher J. Wolf) (NTIS: ADA 183 153)

FAA/AVN-200/25     **Helicopter Microwave Landing System (MLS) Flight Test** (Charles Hale, Paul Maenza)  
(June 1986)

FAA-EE-87-2        **ICAO Helicopter Noise Measurement Repeatability Program** (J. Steven Newman, Maryalice Locke)  
(NTIS: ADA 188 540)

FAA/PM-87/2        **Very Short Range Statistical Forecasting of Automated Weather Observations**  
(Robert G. Miller) (NTIS: ADA 179 104)

FAA/CT-TN87/4      **Simulation Tests of Proposed Instrument Approach Lighting Systems for Helicopter Operations**  
(Paul H. Jones)

FAA/CT-TN87/10     **Heliport Parking, Taxiing, and Landing Area Criteria Test Plan** (Rosanne M. Weiss)  
(NTIS: ADA 189 141)

FAA/CT-TN87/16     **Test Plan for Helicopter GPS Applications**  
(Michael Magrogan) (NTIS: ADA 183 299)

FAA/CT-87/19       **Avionics System Design for High Energy Fields**  
(Roger A. McConnell) (NTIS: ADA 199 212)

FAA/CT-TN87/19     **Microwave Landing System Area Navigation (MLS RNAV) Transformation Algorithms and Accuracy Testing** (Barry Billmann, James H. Remer, Min-Ju Chang) (NTIS: ADA 189 424)

FAA/CT-TN87/21     **Rotorcraft TCAS Evaluation, Group 3 Results**  
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FAA/PM-87/31 FAA/PP-88/1	<b>Analyses of Heliport System Plans</b> (Deborah Peisen, Jack T. Thompson) (NTIS: ADA 195 283)
FAA/PM-87/32 FAA/PP-88/2	<b>Four Urban Heliport Case Studies</b> (Deborah Peisen, Jack T. Thompson) (NTIS: ADA 195 284)
FAA/PM-87/33 FAA/PP-88/3	<b>Heliport System Planning Guidelines</b> (Deborah Peisen) (NTIS: ADA 199 081)
FAA/CT-87/37	<b>De-icing of Aircraft Turbine Engine Inlets</b> (H. Rosenthal, D. Nelepovitz, H. Rockholt) (NTIS: ADA 199 162)
FAA/CT-TN87/40	<b>Heliport Visual Approach and Departure Airspace Tests</b> (Rosanne M. Weiss, Christopher J. Wolf, Maureen Harris, James Triantos)  Vol-I: Summary (NTIS: ADA 200 028) Vol-II: Appendixes
FAA/CT-TN87/54	<b>Analysis of Heliport Environmental Data: Indianapolis Downtown Heliport, Wall Street Heliport</b> (Rosanne M. Weiss, John G. Morrow, Donald Gallagher, Mark DiMeo, Scott Erlichman)  Vol-I: Summary (NTIS: ADA 206 708) Vol-II: Wall Street Heliport Data Plots (NTIS: ADA 212 312) Vol-III: Indianapolis Downtown Heliport Data Plots (NTIS: ADA 217 412)
AVSCOM 8412 (1987)	<b>Report of Investigative Testing of Global Positioning System Slant Range Accuracy</b> (Captain Jeryl S. Cornell)
PS-88-1-LR	<b>FAA Rotorcraft Research, Engineering, and Development Bibliography, 1964-1987</b> (Robert D. Smith)
FAA/DS-88/2 FAA/PS-88/8 NASA CR 177483	<b>"Zero/Zero" Rotorcraft Certification Issues</b> (Richard J. Adams)  Vol-I: Executive Summary (NTIS: N88-25453) Vol-II: Plenary Session Presentations (NTIS: N88-25454)

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Vol-III: Working Group Results  
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FAA/EE-88-2	<b>Helipport Noise Model (HNM) Version 1 User's Manual</b> (D. Keast, K. Eldred, J. Purdum) (NTIS: ADA 219 555)
FAA/PS-88/3	<b>Very Short Range Statistical Forecasting of Automated Weather Observations</b> (Robert G. Miller) (NTIS: ADA 190 803)
FAA/CT-TN88/5	<b>Helipport Visual Approach Surface High Temperature and High Altitude Test Plan</b> (Marvin S. Plotka, Rosanne M. Weise) (NTIS: ADA 200 027)
FAA/DS-88/5	<b>Aeronautical Decision Making for Air Ambulance Helicopter Pilots: Learning from Past Mistakes</b> (Richard J. Adams and Jack T. Thompson) (NTIS: ADA 197 694)
FAA/DS-88/6	<b>Aeronautical Decision Making for Air Ambulance Helicopter Pilots: Situational Awareness Exercises</b> (Richard J. Adams, Jack T. Thompson) (NTIS: ADA 200 274)
FAA/DS-88/7	<b>Risk Management for Air Ambulance Helicopter Operators</b> (Richard J. Adams and Jack T. Thompson) (NTIS: ADA 212 662)
FAA/DS-88/8	<b>Aeronautical Decision Making for Air Ambulance Helicopter Program Administrators</b> (Richard J. Adams and Edwin D. McConkey) (NTIS: ADA 219 404)
FAA/CT-TN88/8	<b>LORAN-C Offshore Flight Following (LOFF) In the Gulf of Mexico</b> (Frank Lorge) (NTIS: ADA 197 779)
FAA/CT-88/10	<b>Digital Systems Valication Handbook - Volume II</b> (R.L. McDowall, Hardy P. Curd, Lloyd N. Popish, Donald Elredge, Susan Mangold, William W. Cooley, Deborah L. Shortess, Myron J. Hecht, John G. McGough, Clifton A. Clarke, William E. Larsen, Roger McConnell, Barbara G. Melander, John E. Reed, Robert E. Evans) (NTIS: ADA 211 451) (Volume I was published as FAA/CT-82/115)

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FAA/DS-88/12	<b>Minimum Required Heliport Airspace Under Visual Flight Rules</b> (Robert D. Smith) (NTIS: ADA 201 433)
FAA/CT-TN88/19	<b>Test Plan for Helicopter Visual Segment Approach Lighting System</b> (Scott B. Schollenberger, Barry R. Billmann)
FAA/CT-88/21	<b>Experimental Guidelines for the Design of Turbine Rotor Fragment Containment Rings</b> (James T. Salvino, Robert A. DeLucia, Tracy Russo) (NTIS: ADA 199 163)
FAA/CT-88/23	<b>Statistics on Aircraft Gas Turbine Engine Rotor Failures that Occurred in U.S. Commercial Aviation During 1982</b> (Robert A. Delucia, James T. Salvino) (NTIS: ADA 199 002)
FAA/CT-TN88/30	<b>Heliport Surface Maneuvering Test Results</b> (Rosanne M. Weiss, Christopher J. Wolf, Scott L. Erlichman, John G. Morrow, Walter E. Dickerson) (NTIS: ADA 214 116)
FAA/CT-TN88/45	<b>Heliport Night Parking Area Criteria Test Plan</b> (Marvin S. Plotka, Rosanne M. Weiss) (NTIS: ADA 208 401)
NAE-AN-55 (1988)	<b>An Investigation of Lateral Tracking Techniques, Flight Directors and Automatic Control Coupling on Decelerating IFR Approaches for Rotorcraft</b> (S. Baillie, Stan Kereliuk and Roger H. Hoh)
FAA/DS-89/03	<b>FAA Rotorcraft Research, Engineering, and Development - Bibliography 1962 - 1988</b> (Robert D. Smith) (NTIS: ADA 207 162)
FAA/CT-89/5	<b>Statistics on Aircraft Gas Turbine Engine Rotor Failures that Occurred in U.S. Commercial Aviation During 1983</b> (R.A. DeLucia, J.T. Salvino) (NTIS: ADA 207 592)
FAA/CT-89/6	<b>Statistics on Aircraft Gas Turbine Engine Rotor Failures that Occurred in U.S. Commercial Aviation During 1984</b> (Robert A. DeLucia, James T. Salvino, Bruce C. Fenton) (NTIS: ADA 212 745)

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FAA/DS-89/9	<b>Rotorcraft Low Altitude CNS Benefit/Cost Analysis; Rotorcraft Operations Data</b> (Brian E. Mee, Deborah Peisen, Margaret B. Renton) (NTIS: ADA 214 113)
FAA/DS-89/17	<b>Accident/Incident Data Analysis Database Summaries</b> (2 Volumes) (Thomas P. Murphy, Richard J. Levendoski)  Vol-I: (NTIS: ADA 214 084) Vol-II: (NTIS: ADA 214 094)
FAA/CT-TN88/19	<b>Test Plan for Helicopter Visual Segment Approach Lighting System</b> (Scott B. Schollenberger, Barry R. Billmann)
FAA/CT-TN89/21	<b>Helicopter Visual Segment Approach Lighting System (HALS) Test Report</b> (Barry Billmann, Scott B. Schollenberger) (NTIS: ADA 214 085)
FAA/CT-89/22	<b>Aircraft Lightning Protection Handbook</b> (F.A. Fisher, J.A. Plumer, R.A. Perala) (NTIS: ADA )
FAA/CT-89/30	<b>Statistics on Aircraft Gas Turbine Engine Rotor Failures that Occurred in U.S. Commercial Aviation During 1986</b> (Robert A. DeLucia, James T. Salvino, Bruce C. Fenton) (NTIS: ADA 220 129)
FAA/CT-TN89/31	<b>Heliport Identification Beacon</b> (Paul H. Jones)
FAA/DS-89/32	<b>Indianapolis Downtown Heliport - Operations Analysis and Marketing History</b> (Robert B. Newman and Deborah J. Peisen) (NTIS: ADA )
FAA/DS-89/37	<b>An Early Overview of Tiltrotor Aircraft Characteristics and Pilot Procedures in Civil Tiltrotor Applications</b> (David L. Green, Harold Andrews, Michael Saraniero)

## APPENDIX C: SUBJECT INDEX

### **ACCIDENT/INCIDENT ANALYSIS/INVESTIGATION**

FAA-EM-73-8	FAA-EM-73-8 (Add. 1)	FAA/CT-82/143
FAA/CT-86/24	FAA/PM-86/28	FAA/CT-86/42
FAA/CT-88/23		

### **ACCIDENTS**

FAA/CT-83/40	FAA/CT-85/11
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### **ADVANCING BLADE CONCEPT (ABC) HELICOPTER**

FAA-RD-78-150

### **AERONAUTICAL DECISION MAKING (ADM)**

FAA/PM-86/41	FAA/PM-86/42	FAA/PM-86/43
FAA/PM-86/44	FAA/PM-86/45	FAA/PM-86/46
FAA/DS-88/5	FAA/DS-88/6	FAA/DS-88/7
FAA/DS-88/8		

### **AIR TRAFFIC CONTROL (ATC) (See also Holding Patterns)**

115-308-3X	RD-64-4	RD-64-55
NA-68-21	FAA-RD-73-47	FAA-RD-78-101
FAA-RD-78-150	FAA-RD-79-123	FAA-RD-80-59
FAA-RD-80-80	FAA-RD-80-85	FAA-RD-80-86
FAA-RD-80-87	FAA-RD-80-88	FAA-RD-81-55
FAA-RD-81-59	FAA/CT-TN86/17	

### **AIRBORNE RADAR APPROACHES (ARA)**

FAA-RD-78-101	FAA-RD-78-150	FAA-RD-79-99
FAA-RD-80-18	FAA-RD-80-22	NA-80-34-LR
FAA-RD-80-59	FAA-RD-80-60	FAA-RD-80-85
FAA-RD-80-88, II	FAA/RD-82/6	FAA/RD-82/40

### **AIRSPACE (See also TERPS)**

FAA/CT-TN86/61	FAA/DS-88/12
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### **AIRWORTHINESS (See also Certification, Composites, and Icing)**

FAA-RD-78-157	FAA/CT-85/26
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### **ANTI-ICING (See Icing)**

### **APPROACH LIGHTS (See Heliport Lighting and Marking)**

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**AREA NAVIGATION (RNAV) (See also GPS, LORAN-C, and MLS RNAV)**

FAA-RD-71-96	FAA-RD-76-146	FAA-RD-78-150
FAA-RD-80-17	FAA-RD-80-64	FAA-RD-80-80
FAA-RD-80-85	FAA-CT-80-175	FAA-RD-81-59
FAA/RD-82/6	FAA/RD-82/7	FAA/CT-82/57
FAA/PM-86/25, I		

**AUTOMATED WEATHER OBSERVING SYSTEM (AWOS)**

FAA/RD-81/40	FAA/CT-TN/85/23	FAA/PM-86/30
FAA/PM-86/52		

**AUTOMATIC DEPENDENT SURVEILLANCE (ADS) (See Dependent Surveillance and LOFF)**

**AUTOMATIC DIRECTION FINDER (ADF) (See Nondirectional Beacon)**

**AUTOROTATION**

NA-67-1	FAA-RD-80-58	FAA/PM-86/28
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**AVIONICS, AIRBORNE RADAR APPROACHES**

FAA-RD-79-99	FAA-RD-80-18	FAA-RD-80-22
FAA-RD-80-60		

**AVIONICS, COMMUNICATIONS**

FAA/PM-85/8

**AVIONICS EQUIPAGE**

FAA/PM-86/25, I

**AVIONICS, GPS (See also GPS)**

FAA/RD-82/8	FAA/RD-82/9	FAA/RD-82/63
FAA/RD-82/71	FAA/CT-82/103	FAA/CT-TN83/03
FAA/CT-TN83/50	FAA/CT-84/47	AVSCOM 8412 (1987)

**AVIONICS, LORAN-C (See also LORAN-C and LOFF)**

FAA-RD-70-10	FAA-RD-80-88	FAA-CT-80-175
FAA-RD-81-27	FAA/RD-82/7	FAA/RD-82/16
FAA/RD-82/78	FAA/CT-TN85/17	

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**AVIONICS, MLS**

FAA/RD-82/40	FAA/CT-TN85/43	FAA/CT-TN85/63
FAA/CT-TN86/30	FAA/CT-TN87/19	

**AVIONICS, TCAS (See TCAS)**

**AWOS (See Automated Weather Observing System)**

**AWOS GEM (Short-range Weather Forecasting)**

FAA/PM-84/31	FAA/PM-86/10	FAA/PM-87/2
FAA/PS-88/3		

**BIBLIOGRAPHY**

FAA-NA-72-39	FAA-RD-74-48	FAA-RD-75-79
FAA-EM-77-15	FAA-RD-81-7-LR	FAA-CT-81-54
FAA/CT-82/152	FAA/PM-86/47	PS-88-1-LR
FAA/DS-89/03		

**CERTIFICATION**

FAA-EE-79-03	FAA-AEE-79-13	FAA-EE-81-4
FAA-EE-84-1	FAA-EE-84-2	FAA-EE-84-3
FAA-EE-84-04	FAA-EE-84-05	FAA-EE-84-6
FAA-EE-84-7	FAA-EE-86-01	FAA/CT-TN86/11
FAA-EE-87-2	FAA/CT-88/10	NAE-AN-55(1988)
FAA/CT-89/22		

**CHARTING**

FAA-RD-78-150

**COCKPIT RESOURCE MANAGEMENT (See also Aeronautical Decision Making)**

FAA/PM-86/46

**COLLISION AVOIDANCE SYSTEM (See also TCAS)**

FAA-NA-72-41	FAA-EM-73-8	FAA-EM-73-8 (Add. 1)
FAA-RD-80-88, I	FAA-RD-81-59	

**COMPOSITE MATERIALS (See also Lightning and Electromagnetic Interference)**

FAA/CT-82/152	FAA/CT-85/7	FAA/CT-86/8
FAA/CT-87/19	FAA/CT-88/10	FAA/CT-89/22

**CONTROLS** (See Flight Controls)

**COST/BENEFIT ANALYSIS**

RD-67-36  
FAA/RD-82/6  
FAA/DS-89/9

FAA-EE-80-5  
FAA/RD-82/40

FAA-EE-81-10  
FAA/PM-84/22

**CRASHWORTHINESS** (See also Fire Safety)

FAA-RD-78-101  
FAA/CT-86/35

FAA/CT-82/152

FAA/CT-85/11

**DECELERATING APPROACHES** (See also Low-speed Approaches, MLS, and Steep Approaches/Departures)

NAE-AN-55(1988)

**DECISION MAKING** (See Aeronautical Decision Making)

**DE-ICING** (See Icing)

**DEPENDENT SURVEILLANCE** (See also LOFF)

FAA-RD-80-85

**DIGITAL SYSTEMS VALIDATION**

FAA/CT-88/10

**DISPLAYS** (See Flight Displays)

**DISTANCE MEASURING EQUIPMENT (DME)**

RD-66-46  
FAA-RD-80-17  
FAA/RD-82/63  
FAA/PM-86/15  
FAA/CT-TN86/42

FAA-RD-71-96  
NA-80-34-LR  
FAA/RD-82/78  
FAA/PM-86/25, T  
FAA/CT-TN87/19

FAA-RD-76-146  
FAA/RD-82/6  
FAA/PM-86/14  
FAA/CT-TN86/30  
AVSCOM 8412 (1987)

**DOPPLER NAVIGATION**

FAA-RD-76-146

**DOWNWASH** (See also Wake Vortexes)

FAA/CT-TN87/10

FAA/CT-TN87/54

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**ELECTROMAGNETIC INTERFERENCE (EMI)** (See Lightning and Electromagnetic Interference)

**EMERGENCY MEDICAL SERVICE (EMS)**

FAA/DS-88/5

FAA/DS-88/6

FAA/DS-88/7

FAA/DS-88/8

FAA/DS-89/9

**FAA INTEGRATED NOISE MODEL**

FAA-EE-79-03

**FIRE SAFETY** (See also Crashworthiness)

FAA/CT-86/24

**FLIGHT CONTROLS**

FAA-RD-78-157

FAA-RD-79-64

FAA-RD-80-64

FAA/CT-82/143

FAA/PM-86/14

FAA/PM-86/15

NAE-AN-26 (1985)

NAE-AN-55 (1988)

**FLIGHT DIRECTORS**

FAA-RD-78-157

FAA-RD-81-7-LR

FAA/PM-86/25, I

NAE-AN-55 (1988)

**FLIGHT DISPLAYS**

FAA-RD-78-157

FAA/CT-82/143

FAA/PM-85/30

**FLIGHT INSPECTION**

FAA/PM-85/7

FAA/CT-TN86/14

**FLY BY WIRE** (See Lighting and Electromagnetic Interference)

**FLY NEIGHBORLY**

FAA-EE-84-1

**FUEL SAFETY** (See also Crashworthiness)

FAA/CT-89/22

**GENERALIZED EQUIVALENT MARKOV (GEM)** (See Weather Forecasts and AWOS GEM)

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**GLOBAL POSITIONING SYSTEM (GPS)**

FAA-RD-76-146	FAA-RD-78-101	FAA-RD-78-150
FAA-RD-80-85	FAA/RD-82/6	FAA/RD-82/8
FAA/RD-82/9	FAA/RD-82/63	FAA/RD-82/71
FAA/RD-82/103	FAA/CT-TN83/03	FAA/CT-TN83/50
FAA/CT-TN84/47	FAA/PM-86/14	FAA/PM-86/15
FAA/CT-TN87/16	AVSCOM 8412 (1987)	

**GULF OF MEXICO (See also LOFF and Offshore Operations)**

NA-80-34-LR	FAA-RD-80-47	FAA-RD-80-85
FAA-RD-80-87	FAA-RD-80-88	FAA/RD-81/40
FAA-RD-81-59	FAA/RD-82/7	FAA/CT-TN85/5

**HANDLING QUALITIES**

FAA-RD-78-157	FAA-RD-79-59	FAA-RD-79-64
FAA-RD-80-58	FAA-RD-80-64	FAA/CT-83/6
NAE-AN-26 (1985)	NAE-AN-55 (1988)	FAA/DS-89/37

**HEIGHT-VELOCITY DIAGRAM**

NA-67-1	FAA-RD-80-58	FAA-RD-80-88, II
FAA/PM-86/28		

**HELICOPTER NOISE (See Noise)**

**HELICOPTER OPERATIONS STATISTICS (See Rotorcraft Operations Statistics)**

**HELICOPTER PERFORMANCE (See Rotorcraft Performance)**

**HELIPORTS/VERTIPOINTS (See various heliport categories below)**

**HELIPORT AIRSPACE (See also Heliport VFR Airspace and TERPS)**

FAA-RD-80-58	FAA-RD-80-107	FAA/RD-81/35
FAA/CT-TN87/40	FAA/CT-TN88/5	FAA/DS-88/12

**HELIPORT CASE STUDIES**

FAA/PM-87/32

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**HELIPORT DESIGN** (See also Downwash, Heliport Airspace, Heliport Lighting, Heliport Parking Areas, Heliport VFR Airspace, MLS Siting, and AWOS)

FAA-RD-78-101	FAA-RD-80-107	FAA-RD-81-35
FAA/CT-82/120	FAA/PM-84/22	FAA/PM-84/23
FAA/PM-84/25	FAA/CT-TN84/31	PM-85-2-LR
PM-85-3-LR	PM-85-4-LR	FAA/PM-85/7
FAA/CT-TN86/61	FAA/CT-TN86/64	FAA/DS-88/12

**HELIPORT LIGHTING/MARKING**

NA-69-2	FAA-RD-71-105	FAA-RD-72-133
FAA-RD-78-101	NA-80-34-LR	FAA-RD-80-59
FAA/CT-82/120	FAA/CT-TN84/34	FAA/CT-TN86/22
FAA/CT-TN87/4	FAA/CT-TN88/19	FAA/CT-TN89/21
FAA/CT-TN89/31		

**HELIPORT NOISE MODEL (HNM)** (See also Noise, Noise Modeling)

FAA/EE-88-2

**HELIPORT PARKING AREAS AND TAXIWAYS**

FAA/CT-TN87/10	FAA/CT-TN87/54, I	FAA/CT-TN88/30
FAA/CT-TN88/45		

**HELIPORT PLANNING**

FAA-RD-80-107	FAA/RD-81/35	FAA/PM-84/22
FAA/PM-84/25	FAA/PM-87/31	FAA/PM-87/32
FAA/PM-87/33	FAA/DS-89/32	

**HELIPORT SNOW AND ICE CONTROL**

FAA/PM-84/22

**HELIPORT VFR AIRSPACE**

FAA-RD-80-107	FAA/RD-81/35	FAA/CT-TN86/61
FAA/CT-TN87/40	FAA/CT-TN88/5	FAA/DS-88/12

**HIGH FREQUENCY (HF) COMMUNICATION**

FAA-RD-78-150

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**HOLDING PATTERNS**

FAA-RD-78-150	FAA-RD-80-59	FAA-RD-80-80
FAA-RD-80-86	FAA-RD-80-88	FAA/CT-TN86/63

**HUMAN FACTORS** (See also Emergency Medical Service, Flight Controls, Flight Displays, TCAS and Training)

FAA-RD-81-59	FAA/CT-83/6	FAA/CT-83/40
FAA/PM-86/28	FAA/PM-86/45	FAA/DS-89/17

**ICING** (See also Weather and Weather Forecasting)

FAA-RD-78-101	FAA-RD-80-24	FAA-CT-80-210
FAA/CT-81/35	FAA/CT-83/7	FAA/CT-83/21
FAA/CT-83/22	FAA/PM-84/22	FAA/CT-85/26
FAA/CT-TN86/11	FAA/CT-86/35	FAA/CT-87/37

**INERTIAL NAVIGATION SYSTEM (INS)**

FAA-RD-76-146	FAA-RD-80-85	FAA/RD-82/7
FAA/RD-82/24		

**INSTRUMENT LANDING SYSTEM (ILS)**

FAA/RD-82/6	FAA/CT-TN85/24	FAA/PM-86/14
FAA/PM-86/15	FAA/PM-86/25, I	

**LIGHTING** (See Heliport Lighting)

**LIGHTNING AND ELECTROMAGNETIC INTERFERENCE (EMI)**

FAA/CT-86/8	FAA/CT-87/19	FAA/CT-88/10
FAA/CT-89/22		

**LORAN-C** (See also LOFF)

FAA-RD-70-10	FAA-RD-76-146	NA-78-55-LR
FAA-RD-78-101	FAA-RD-78-150	FAA-RD-80-20
FAA-RD-80-47	FAA-RD-80-85	FAA-RD-80-87
FAA-RD-80-88	FAA-CT-80-175	FAA-RD-81-27
FAA-RD-81-59	FAA/RD-82/6	FAA/RD-82/7
FAA/RD-82/16	FAA/RD-82/24	FAA/RD-82/57
FAA/RD-82/78	FAA/PM-83/4	FAA/PM-83/32
FAA/CT-TN85/5	FAA/CT-TN85/17	FAA/PM-86/14
FAA/PM-86/15		

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**LORAN-C VERTICAL NAVIGATION (VNAV)**

FAA/RD-82/16                      FAA/CT-TN86/56

**LORAN FLIGHT FOLLOWING (LOFF)**

FAA-RD-80-85	FAA-RD-80-87	FAA-RD-80-88
FAA-RD-81-55	FAA-RD-81-59	FAA/CT-TN86/17
FAA/CT-TN88/8		

**LOW-ALTITUDE COMMUNICATIONS (See also Northeast Corridor)**

FAA-RD-78-101	FAA-RD-78-150	FAA-RD-79-123
FAA-RD-80-20	FAA-RD-80-80	FAA-RD-80-87
FAA-CT-80-198	FAA-RD-81-9	FAA/RD-81/40
FAA-RD-81-59	PM-85-2-LR	FAA/PM-85/8
FAA/DS-89/9		

**LOW-ALTITUDE NAVIGATION (See also LORAN-C, Northeast Corridor, and GPS)**

RD-66-46	RD-67-36	FAA-RD-71-96
FAA-RD-76-146	NA-78-55-LR	FAA-RD-78-101
FAA-RD-78-150	FAA-CT-80-18	FAA-RD-80-20
FAA-RD-80-80	FAA-RD-80-87	FAA-RD-81-59
FAA/PM-83/32		

**LOW-ALTITUDE SURVEILLANCE (See also LOFF)**

FAA-RD-78-150	FAA-RD-80-20	FAA-RD-80-80
FAA-RD-80-87	FAA-RD-81-59	FAA/DS-89/9

**LOW-SPEED APPROACHES (See also Decelerating Approaches, Steep Approaches/Departures)**

NA-68-21	FAA-RD-80-58	NAE-AN-26 (1985)
FAA/PM-86/14	FAA/PM-86/15	FAA/CT-TN86/31
NAE-AN-26 (1985)	FAA/CT-TN86/42	

**MARKING/LIGHTING OF HELIPORTS (See Heliport Lighting/Marking)**

**MICROWAVE LANDING SYSTEM (MLS) FLIGHT INSPECTION (See Flight Inspection)**

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**MICROWAVE LANDING SYSTEM, GENERAL** (See also DME and other MLS listings below)

FAA-RD-78-101	FAA/RD-82/6	FAA/RD-82/40
FAA/CT-TN84/16	FAA/CT-TN84/20	FAA/CT-TN84/40
FAA/PM-85/7	FAA/CT-TN85/15	FAA/CT-TN85/53
FAA/CT-TN85/55	FAA/CT-TN85/58	FAA/CT-TN85/63
FAA/CT-TN85/64	FAA/CT-86/14	FAA/PM-86/14
FAA/PM-86/15	FAA/CT-TN86/30	FAA/CT-TN86/40
FAA/CT-TN86/42	FAA/AVN-200/25 (1986)	AVSCOM 8412 (1987)
FAA/CT-TN89/21		

**MICROWAVE LANDING SYSTEM RNAV** (See also other MLS listings)

FAA-RD-80-59	FAA/RD-82/40	FAA/PM-85/7
FAA/CT-TN85/43	FAA/CT-TN85/63	FAA/PM-86/25, I
FAA/CT-TN87/19		

**MICROWAVE LANDING SYSTEM SITING** (See also other MLS listings)

FAA/CT-TN84/40	FAA/CT-TN85/53	FAA/CT-85/58
FAA/CT-TN85/64	FAA/CT-TN86/64	

**MICROWAVE LANDING SYSTEM TERPS** (See also TERPS and other MLS listings)

FAA-RD-80-59	FAA-RD-81-167	FAA/CT-TN84/16
FAA/CT-TN84/20	FAA/CT-TN85/53	FAA/CT-TN85/55
FAA/CT-TN86/31	FAA/CT-TN86/63	
FAA/AVN-200-25 (1986)		

**MID-AIR COLLISIONS** (See Near Mid-air Collisions)

**MILITARY TRAINING ROUTES**

FAA-RD-80-88, I

**MISSED APPROACH**

FAA/DS-89/37

**NAVIGATION SATELLITE TIMING AND RANGING (NAVSTAR)** (See GPS)

**NEAR MID-AIR COLLISIONS** (See also TCAS)

FAA-NA-72-41	FAA-EM-73-8	FAA-EM-73-8 (Add. 1)
FAA-RD-80-88, I	FAA/CT-83/40	FAA/PM-85/6

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**NIGHT TESTING** (See also Heliport Lighting/Marking)

FAA/CT-TN88/45

**NOISE**

FAA-RD-73-145	FAA-RD-75-79	FAA-RD-75-125
FAA-RD-75-190	FAA-RD-76-1	FAA-RD-76-49
FAA-RD-76-116	FAA-RD-77-57	FAA-RD-77-94
FAA-RD-78-101	FAA-EE-79-03	FAA-AEE-79-13
FAA-RD-79-107	FAA-EE-80-5	FAA-AEE-80-34
FAA-EE-80-41	FAA-EE-80-42	FAA-EE-81-4
FAA-EE-81-10	FAA-EE-81-13	FAA-EE-81-16
FAA-EE-82-16	FAA-EE-82-20	FAA-EE-83-2
FAA-EE-83-5	FAA-EE-83-6	FAA-EE-84-1
FAA-EE-84-2	FAA-EE-84-3	FAA-EE-84-04
FAA-EE-84-05	FAA-EE-84-6	FAA-EE-84-7
FAA-EE-84-15	FAA-EE-85-3	FAA-EE-85-6
FAA-EE-85-7	CERL TR N-85/14	FAA-EE-86-01
FAA-EE-86-04	FAA-EE-87-2	

**NOISE ABATEMENT** (See also Fly Neighborly)

FAA-EE-85-7

**NOISE CONTOURS**

FAA-EE-80-41	FAA-EE-81-16	FAA-EE-82-16
FAA-EE-84-1	FAA-EE-84-2	FAA-EE-84-3
FAA-EE-84-04	FAA-EE-84-05	FAA-EE-84-6
FAA-EE-84-7	FAA-EE-85-7	

**NOISE MODELING**

FAA-EE-79-03	FAA-EE-80-41	FAA-EE-80-42
FAA-EE-81-4	FAA-EE-82-16	FAA/EE-88-2

**NOISE REDUCTION**

FAA-EE-80-5	FAA-EE-81-4	FAA-EE-81-10
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**NOISE SURVEYS**

FAA-EE-82-20	FAA-EE-83-2	FAA-EE-83-5
FAA-EE-83-6	FAA-EE-84-15	FAA-EE-85-3
FAA-EE-86-04		

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**NONDIRECTIONAL BEACON (NDB)**

FAA-RD-76-146	FAA-RD-78-101	FAA-RD-78-150
FAA-RD-80-85	FAA/RD-82/6	FAA/PM-86/25, I

**NONPRECISION APPROACHES (See also Airborne Radar Approaches)**

NA-80-34-LR	FAA-CT-80-175	FAA-RD-81-27
FAA/RD-82/8	FAA/RD-82/9	FAA/RD-82/16
FAA/RD-82/71	FAA/RD-82/78	FAA/CT-82/103
FAA/CT-TN83/03	FAA/CT-TN84/34	FAA/CT-TN85/17
FAA/PM-86/25, I	FAA/CT-TN86/56	

**NORTHEAST CORRIDOR**

RD-66-46	RD-67-36	FAA-RD-70-10
FAA-RD-80-17	FAA-RD-80-59	FAA-RD-80-80
FAA-CT-80-175	FAA-RD-81-59	FAA/CT-82/57
FAA/RD-82/78	FAA/CT-TN85/17	

**OBSTRUCTION AVOIDANCE (See also Airborne Radar Approaches, Heliport VFR Airspace, and TERPS)**

FAA-RD-81-59	FAA-RD-80-107	FAA/PM-86/28
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**OFFSHORE OPERATIONS (See also Gulf of Mexico and Airborne Radar Approaches)**

FAA-RD-76-146	NA-78-55-LR	FAA-RD-79-123
FAA-RD-80-20	NA-80-34-LR	FAA-RD-80-87
FAA-RD-80-107	FAA-RD-81-27	FAA-RD-81-55
FAA/RD-82/6	FAA/PM-83/4	

**OMEGA**

NA-78-55-LR	FAA-RD-78-101	FAA-RD-78-150
FAA-RD-80-85	FAA-RD-80-88, II	FAA/RD-82/6
FAA/PM-86/14	FAA/PM-86/15	

**PARKING AREAS (See Heliport Parking Areas and Taxiways)**

**PILOT WORKLOAD (See Workload)**

**POWERED-LIFT AIRCRAFT (See also Tiltrotor)**

FAA-RD-76-100	FAA-RD-78-100	FAA-RD-79-59
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## APPENDIX E: ACRONYMS

ABC	Advancing blade concept
ADF	Automatic direction finder
ADS	Automatic dependent surveillance
AGL	Above ground level
AM	Amplitude modulated
AMA	Analytical Mechanics Associates
AOPA	Aircraft Owners and Pilots Association
ARA	Airborne RADAR Approach
ARINC	Aeronautical Radio Inc.
ASF	Air Safety Foundation
ATC	Air traffic control
AVARADA	U.S. Army Avionics Research and Development Activity
AWOS	Automated weather observing system
AWOS GEM	AWOS generalized equivalent markov
CAA	Civil Aviation Authority (UK)
CAEP	Committee on Aviation Environmental Problems
CAN	Committee on Aircraft Noise (ICAO)
CERL	U.S. Army Construction Engineering Research Laboratory
DME	Distance Measurement Equipment
DNL	Day/Night Average Sound Level
DOT	Department of Transportation
E-L	Electroluminescent
EMC	Electromagnetic compatibility

Appendix E: Acronyms

EMI	Electromagnetic interference
EMS	Emergency medical service
EPNL	Effective Perceived Noise Level
FAA	Federal Aviation Administration
FAATC	FAA Technical Center
FAR	Federal Aviation Regulation
FLIR	Forward looking infrared radar
FSF	Flight Safety Foundation
GEM	Generalized equivalent markov
GPS	Global positioning system
HAA	Helicopter Association of America
HAI	Helicopter Association International
HIGE	Hover in ground effect
HF	High frequency
HNM	Heliport Noise Model
HNMRP	Helicopter Noise Measurement Repeatability Program (ICAO)
HOG	Hover out-of-ground effect
ICAO	International Civil Aviation Organization
IFR	Instrument flight rules
IGE	In ground effect
ILS	Instrument landing system
INS	Inertial navigation system
KIAS	Knots indicated airspeed
LOFF	Loran flight following

Appendix E: Acronyms

MLS	Microwave landing system
NAE	National Aeronautical Establishment
NAFEC	National Aviation Facilities Experimental Center
NASA	National Aeronautics and Space Administration
NAVSTAR	Navigation satellite timing and ranging
NDB	Nondirectional beacon
NRC	National Research Council (Canada)
NRL	Naval Research Laboratory
NWS	National Weather Service
OGE	Out of ground effect
PAR	Precision approach radar
RNAV	Area navigation
RPM	Revolutions per minute
SCT	Systems Control Technology
SEL	Sound exposure level
STOL	Short takeoff and landing
TACAN	Tactical air navigation
TCAS	Traffic alert and collision avoidance system
TERPS	Terminal instrument procedures
VFR	Visual flight rules
VLATME	Very light weight air traffic management equipment
VNAV	Vertical navigation
VOR	Very high frequency omnidirectional radio range
VTOL	Vertical takeoff and landing

## APPENDIX F: ABSTRACTS

This report is a supplement to "FAA Helicopter/Heliport Research, Engineering, and Development - Bibliography, 1964 - 1986" (FAA/PM-86/47) published in November 1986 (NTIS accession number ADA 174 697) and to "FAA Rotorcraft Research, Engineering, and Development Bibliography, 1962 - 1988" (FAA/DS-89/03) published in March 1989 (NTIS accession number ADA 207 162). The bibliography and the indexes contained in this report include all of what was published in the earlier documents. However, Appendix F of this report does not contain any abstracts which were included in FAA/PM-86/47 and FAA/DS-89/03. Abstracts contained herein are only for those reports which have been published subsequent to the earlier bibliography plus any earlier reports which had been overlooked inadvertently.

1. Report No. DOT-FAA-EE-79-03	2. Government Accession No. ADA 074 532	3. Recipient's Catalog No.	
4. Title and Subtitle Noise Levels and Flight Profiles of Eight Helicopters Using Proposed International Certification Procedures		5. Report Date March 1979	6. Performing Organization Code DOT/FAA
		8. Performing Organization Report No. DOT-FAA-EE-79-03	
7. Author(s) J. Steven Newman and Edward J. Rickley*		10. Work Unit No. (TRAIS)	11. Contract or Grant No.
9. Performing Organization Name and Address Department of Transportation Federal Aviation Administration 800 Independence Avenue, S.W. Washington, D.C. 20591		13. Type of Report and Period Covered Final Report	
12. Sponsoring Agency Name and Address Department of Transportation Federal Aviation Administration 800 Independence Avenue, S.W. Washington, D.C. 20591		14. Sponsoring Agency Code FAA	
15. Supplementary Notes *U.S. Department of Transportation, Transportation Systems Center, Kendall Square, Cambridge, Massachusetts 02142			
16. Abstract  This document reports the findings of helicopter noise tests conducted at the FAA National Aviation Facility Experimental Center (NAFEC), located in Atlantic City, New Jersey. The tests were conducted with the following objectives: first, determine the feasibility of a takeoff procedure for helicopter noise certification; second, establish a data base of helicopter noise levels to be used in defining noise standards; third, acquire helicopter acoustical spectral data for a variety of acoustical angles for use in the FAA Integrated Noise Model. This report addresses the first two objectives. Noise data are presented in terms of the corrected Effective Perceived Noise Level (EPNL). Corrections of data are carried out in accordance with FAR 36 procedures and/or procedures considered appropriate for use in possible future noise standards. Position corrections are conducted using unique takeoff reference flight paths for each helicopter; approach and level flyover reference paths are the same for all the helicopters. Correction procedures are evaluated for applicability to helicopter noise sources. Flight profiles and ground tracks are presented for each takeoff event along with ground speed data. Actual cockpit indicated air speed is also reported for most events along with main rotor RPM. A regression analysis is conducted correlating EPNL with helicopter weight for the NAFEC test data. An aggregate regression analysis is also conducted which groups NAFEC helicopter data with data from other sources.			
17. Key Words Effective Perceived Noise Level (EPNL) Noise Data Corrections Reference Flight Paths Helicopter Noise Certification. Helicopter Noise		18. Distribution Statement This document is available to the U.S. public through the National Technical Information Service, Springfield, Virginia 22161.	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 298	22. Price

1. Report No. FAA-AEE-79-13	2. Government Accession No. ADA 080 525	3. Recipient's Catalog No.	
4. Title and Subtitle  Assessment of the Environmental Compatibility of Differring Helicopter Noise Certification Standards		5. Report Date June 1979	
		6. Performing Organization Code	
		8. Performing Organization Report No.	
7. Author(s) Richard G. Edwards, et. al.		10. Work Unit No. (TRAIS)	
9. Performing Organization Name and Address Watkins and Associates, Inc., 446 East High Street Lexington, Kentucky 40588 University of Kentucky Lexington, Kentucky 40506		11. Contract or Grant No. DOT-FA78WA-4194	
		13. Type of Report and Period Covered	
12. Sponsoring Agency Name and Address Federal Aviation Administration Office of Environment and Energy 800 Independence Avenue, S.W. Washington, D.C. 20591		14. Sponsoring Agency Code AEE-110	
15. Supplementary Notes			
16. Abstract  Areas having the heaviest helicopter activity in the U.S. were visited and environmental noise measurements made in order to evaluate the impact of possible relaxed noise emission standards for helicopters restricted to remote regions. Measurement results showed that an average of 10 flyovers per hour produced a one-hour energy-averaged sound level (Leq) of 54.5 dBA, a level 2.5 dBA above ambient. An average of 34 events per hour adjacent to heliports produced a one-hour Leq of 63.1 dBA, which was 13.3 dBA above ambient. If emission levels were increased by 10 dBA, projected Leq <sup>(24)</sup> values of 57.0 and 71.2 dBA resulted for the flyover and heliport conditions, respectively. Sixty-four percent of those responding to a questionnaire stated that they had not experienced a problem from helicopter noise. The degree to which the remaining respondents were bothered ranged from "slightly" to "very annoyed" with no significant preference for either category.			
17. Key Words  Noise; Helicopter Noise; Helicopter Operations; Noise Standards		18. Distribution Statement  Document is available to the public through the National Technical Information Service, Springfield, Virginia 22151	
19. Security Classif. (of this report)  Unclassified	20. Security Classif. (of this page)  Unclassified	21. No. of Pages	22. Price

1. Report No. FAA-RD-79-107	2. Government Accession No. ADA 082 616	3. Recipient's Catalog No.	
4. Title and Subtitle V/STOL Rotary Propulsor Noise Prediction Model Update and Evaluation		5. Report Date December, 1979	6. Performing Organization Code
		8. Performing Organization Report No.	
7. Author(s) B. Magliozzi		10. Work Unit No. (TRAIS)	
9. Performing Organization Name and Address Hamilton Standard Division of United Technologies Corp. Windsor Locks, Connecticut 06096		11. Contract or Grant No. DOT-FA77WA-4067	
		13. Type of Report and Period Covered Final Report	
12. Sponsoring Agency Name and Address U.S. Department of Transportation Federal Aviation Administration Systems Research and Development Service Washington, D. C. 20590		14. Sponsoring Agency Code ARD-650 (2015-607)	
15. Supplementary Notes			
16. Abstract <p>The V/STOL Rotary Propulsor Noise Prediction Model developed under contract DOT-FA74WA-3477 was updated and evaluated. A three-phase program was conducted. In the first phase, a literature review was conducted to identify and evaluate high quality noise measurements of propeller, variable pitch fan, fixed pitch fan, helicopter, lift fan, core engine, and jet noise for the preparation of a data base with emphasis on recent measurements of in-flight propulsors. In the second phase, the effects of forward flight on V/STOL propulsor noise were evaluated and the noise prediction model was improved to give better agreement with current measurements. In the third phase, the performance of the noise prediction methodology was evaluated by comparison of calculations with measurements of propulsor noise from the data base.</p> <p>Although certain aspects of the measured propulsor noise, such as installation and ground reflection effects, caused discrepancies between measured and calculated levels (the calculations assume uninstalled propulsors under free-field conditions), the general correlation was good. Typical correlation between measured and calculated one-third octave band levels was <math>\pm 5</math> dB and between measured and calculated dB(A), PNL, PNLT, and EPNL was <math>\pm 3</math> dB.</p>			
17. Key Words Propeller Noise/Variable Pitch Fan Noise/Helicopter Noise/Jet Noise/Helicopter Noise/Noise Prediction/Fixed Pitch Fan Noise/Forward Flight Effects on Noise		18. Distribution Statement This document is available to the public through the National Technical Information Service, Springfield, Virginia 22151	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 230	22. Price

1. Report No. FAA-EE-80-5	2. Government Accession No. ADA 083 955	3. Recipient's Catalog No.	
4. Title and Subtitle Study of Cost/Benefit Tradeoffs Available in Helicopter Noise Technology Applications		5. Report Date January 1980	
		6. Performing Organization Code	
		8. Performing Organization Report No.	
7. Author(s) R. H. Spencer, H. Sternfeld, Jr.		10. Work Unit No. (TRAIS)	
9. Performing Organization Name and Address Boeing Vertol Co. Philadelphia, Pennsylvania		11. Contract or Grant No. DOT-FA78WA-4161	
		13. Type of Report and Period Covered Final Report	
12. Sponsoring Agency Name and Address Federal Aviation Administration Office of Environment and Energy 800 Independence Avenue Washington, D.C. 20591		14. Sponsoring Agency Code AEE-110	
15. Supplementary Notes			
16. Abstract <p>This study investigated cost/benefit tradeoffs using the case histories of four helicopters for which design and development were complete, and in three cases, have undergone substantial flight testing. The approach to quieting each helicopter was an incremental reduction of each source as required to obtain reductions in flyover noise with modifications to other secondary systems only as necessary. The methodology used to predict the effects of the design modifications on acquisition, maintenance, and operating costs were typical of those employed by rotorcraft manufacturers. The reduction of helicopter flyover noise generally was achieved through reductions in rotor tip speed. Performance characteristics were maintained to specified minimums for each aircraft in the study.</p>			
17. Key Words Noise, Helicopters, Cost/Benefit Study		18. Distribution Statement Document is available to the public through the National Technical Information Service, Springfield, Virginia 22161	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 127	22. Price

1. Report No. FAA-AEE-80-34	2. Government Accession No. ADA 100 691	3. Recipient's Catalog No.	
4. Title and Subtitle Helicopter Noise Exposure Level Data: Variations With Target Test		5. Report Date July 10, 1980	
		6. Performing Organization Code DOT/FAA	
		8. Performing Organization Report No. FAA-AEE-80-34	
7. Author(s) J. Steven Newman		9. Performing Organization Name and Address Department of Transportation, Federal Aviation Admin. Office of Environment and Energy, Noise Div. Tech. Branch 800 Independence Ave., S.W. Washington, D.C. 20591	
12. Sponsoring Agency Name and Address		10. Work Unit No. (TRAIS)	
		Contract or Grant No.	
		13. Type of Report and Period Covered Preliminary Report	
		14. Sponsoring Agency Code FAA	
15. Supplementary Notes			
16. Abstract  This report provides uncorrected noise exposure level data measured using an integrating sound level meter at a single measurement location during the recently completed, week long, FAA helicopter noise test. In addition to the measurements herein reported, primary acoustical measurements have been conducted by the Transportation Systems Center Noise Measurement and Assessment Laboratory. This acoustical data (acquired for nine microphones) will be combined with flight path track data processed at the FAA, Dulles Noise Laboratory by D.W. Ford. Meteorological data acquired from surface reading and radiosondes will be processed by U.S. Weather Service Personnel.  The collection and reporting of these data will require a considerable period of time. Thus, this report has been prepared to provide limited but nevertheless useful information to interested parties.			
17. Key Words Helicopter, noise		18. Distribution Statement This document is available to the public through the National Technical Information Service, Springfield, VA 22161	
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1. Report No. DOT/FAA-EE-80-41	2. Government Accession No. ADA 093 426	3. Recipient's Catalog No.	
4. Title and Subtitle Helicopter Noise Contour Development Techniques and Directivity Analysis		5. Report Date September 1980	
		6. Performing Organization Code DOT/FAA	
7. Author(s) J. Steven Newman		8. Performing Organization Report No. DOT/FAA/EE-80-41	
9. Performing Organization Name and Address Department of Transportation, Federal Aviation Admin. Office of Environment and Energy, Noise Div., Tech Br. 800 Independence Avenue, S.W. Washington, D.C. 20591		10. Work Unit No. (TRAIS)	
		11. Contract or Grant No.	
12. Sponsoring Agency Name and Address		13. Type of Report and Period Covered Preliminary	
		14. Sponsoring Agency Code FAA	
15. Supplementary Notes			
16. Abstract  This paper briefly summarizes techniques which have been developed for use in creating helicopter air-to-ground, noise-distance relationships. Discussion is provided concerning FAA efforts to establish an accurate and practical method (which considers sources directivity) for modeling the noise impact associated with helicopter operations. Pilots of normalized directivity vectors are provided for eight helicopters in various modes of flight.			
17. Key Words Helicopter, Noise Contour, Noise, Directivity		18. Distribution Statement This document is available to the public through the National Technical Information Services, Springfield, Virginia 22161	
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1. Report No. DOT-FAA-EE-80-42	2. Government Accession No. ADA 093 482	3. Recipient's Catalog No.	
4. Title and Subtitle Correlation of Helicopter Noise Levels With Physical and Performance Characteristics		5. Report Date September 1980	
		6. Performing Organization Code DOT/FAA	
7. Author(s) J. Steven Newman		8. Performing Organization Report No. DOT-FAA-EE-80-42	
9. Performing Organization Name and Address Department of Transportation, Federal Aviation Admin. Office of Environment and Energy, Noise Div., Tech. Branch 800 Independence Avenue, S.W. Washington, D.C. 20591		10. Work Unit No. (TRAIS)	
		11. Contract or Grant No.	
12. Sponsoring Agency Name and Address		13. Type of Report and Period Covered  Preliminary	
		14. Sponsoring Agency Code FAA	
15. Supplementary Notes			
16. Abstract  This report investigates the correlation between physical and performance characteristics of helicopters and the noise levels which they generate in various operational modes. The analysis is generally empirical although several theoretical functions described in the literature have been examined. The EPNL is the acoustical metric employed in this study. One, two, and three-step multiple regression analyses are conducted for takeoff, approach, and level flyover operations. Plots are provided for the three best single variable regression models for each mode of flight.			
17. Key Words  Helicopter, Noise, Noise Prediction, Correlation, Regression, Effective Perceived Noise Level (EPNL)		18. Distribution Statement  This document is available to the public through the National Technical Information Services, Springfield, Virginia 22161	
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7. Author(s) <b>James Coyle</b>		8. Performing Organization Report No. <b>FAA-CT-80-198</b>	
9. Performing Organization Name and Address <b>Federal Aviation Administration Technical Center Atlantic City, New Jersey 08405</b>		10. Work Unit No. (TRAIS)	
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12. Sponsoring Agency Name and Address <b>Federal Aviation Administration Systems Research and Development Service Washington, DC 20591</b>		13. Type of Report and Period Covered <b>Project Plan</b>	
		14. Sponsoring Agency Code	
15. Supplementary Notes			
16. Abstract <p>Communications, navigation, air traffic control (ATC) procedures, IFR certification and weather and icing are the major issues identified in the Helicopter Operations Development Plan for study and analysis. The communications study and analysis requirements addressed by this project include the methods by which information such as clearances, unique weather conditions, and position reports are conveyed between air and surface elements of the NAS especially where the communications link extends beyond line-of-sight. Line-of-sight considerations are extremely important with helicopter operations due to their unique low-altitude flight characteristics and the remote locations they service such as offshore oil rigs.</p> <p>A helicopter A/G communications project was established at the Federal Aviation Administration Technical Center to assist the Systems Research and Development Service (SRDS) and FAA regional field facilities in establishing extended-range, low-altitude A/G communications on a priority basis in areas of need. Initial project efforts were directed toward assisting the Eastern Region with the design, acquisition, establishment, test, and evaluation of a low-altitude, extended-range helicopter communications system for the offshore New Jersey oil exploration area. Details of this project are included in Interim Report No. FAA-RD-79-123, dated January 1980. Other geographic-specific areas identified for project assistance include Appalachia and the Gulf of Mexico.</p>			
17. Key Words <b>Helicopter low altitude Air/Ground Communication</b>		18. Distribution Statement <b>Document is on file at the Technical Center Library, Atlantic City Airport, New Jersey 08405</b>	
19. Security Classif. (of this report) <b>Unclassified</b>	20. Security Classif. (of this page) <b>Unclassified</b>	21. No. of Pages <b>7</b>	22. Price

1. Report No. <b>FAA-EE-81-4</b>		2. Government Accession No. <b>ADA 103 331</b>		3. Recipient's Catalog No.	
4. Title and Subtitle <b>A Comprehensive Bibliography of Literature on Helicopter Noise Technology</b>				5. Report Date <b>June 1981</b>	
				6. Performing Organization Code	
				8. Performing Organization Report No.	
7. Author(s) <b>A.M. Carter, Jr.</b>					
9. Performing Organization Name and Address <b>HOPE Associates, Inc. 3024 Porter Street, N.W., Suite #303 Washington, D.C. 20008</b>				10. Work Unit No. (TRAIS)	
				11. Contract or Grant No. <b>DOT-FAA-DTFA-01-80-Y-105-97</b>	
				13. Type of Report and Period Covered	
12. Sponsoring Agency Name and Address <b>Federal Aviation Administration Office of Environment and Energy 800 Independence Avenue, S.W. Washington, D.C. 20591</b>				14. Sponsoring Agency Code <b>AEE-110</b>	
15. Supplementary Notes					
<p>16. Abstract</p> <p>The basic purposes of this report are to provide a comprehensive BIBLIOGRAPHY of Helicopter Noise Technology literature covering the period 1975 through calendar 1980, to present this bibliography arranged by helicopter NOISE TECHNOLOGY AREAS, and to provide ABSTRACTS on literature that appear to make a significant contribution to the field of helicopter noise technology.</p> <p>The helicopter is recognized as a complex noise generator, with significant contributions from the rotors, the engine and the gearbox. Much progress continues to be made in the noise areas of: (a) Formulations, Math Models and Analytical Procedures; (b) Noise Prediction Methodology; (c) Noise Reduction Techniques; and (d) Subjective Response to helicopter noise. The body of information, data and knowledge has use in many applications, including the reduction of helicopter noise in a cost effective manner and in minimizing annoyance to the civil populace.</p> <p>This report has been arranged with the objective of being most useful to those having an interest in the individual areas of helicopter noise technology, as well as those having an overall interest in the field. It is intended that this report will be of particular use to those persons involved in: (a) the Formulation, Math Modeling and Analysis related to helicopter noise technology; (b) Prediction Methodology associated with helicopter noise; (c) Helicopter Noise Reduction Techniques; and (d) the Subjective Response to helicopter noise, both from a helicopter certification and community reaction standpoint.</p>					
17. Key Words <b>Helicopter Noise, Noise Formulations, Noise Math Models, Noise Prediction, Noise Reduction, Subjective Response, Rotor Noise, Gearbox Noise, Engine Noise, Annoyance Criteria, Noise Certification Criteria</b>			18. Distribution Statement <b>This document is available to the public through the National Technical Information Service, Springfield, Virginia 22161</b>		
19. Security Classif. (of this report) <b>Unclassified</b>		20. Security Classif. (of this page) <b>Unclassified</b>		21. No. of Pages <b>112</b>	
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1. Report No. FAA-EE-81-10	2. Government Accession No. ADA 101 768	3. Recipient's Catalog No.	
4. Title and Subtitle Impact of Prediction Accuracy on Costs - Noise Technology Applications in Helicopters		5. Report Date June 1981	
		6. Performing Organization Code	
7. Author(s) R. H. Spencer, H. Sternfeld, Jr.		8. Performing Organization Report No.	
9. Performing Organization Name and Address Boeing Vertol Co. Philadelphia, Pennsylvania		10. Work Unit No. (TRAIS)	
		11. Contract or Grant No. DOT-FA78WA-4161	
12. Sponsoring Agency Name and Address Federal Aviation Administration Office of Environment and Energy 800 Independence Avenue, S.W. Washington, D.C. 20591		13. Type of Report and Period Covered	
		14. Sponsoring Agency Code AEE-110	
15. Supplementary Notes			
16. Abstract  <p>This study is an extension of the work reported in Reference 1, "A Study of Cost/Benefit Tradeoffs Available in Helicopter Noise Technology Applications", and considers the effect which uncertainties in the prediction and measurement of helicopter noise have on the development and operating costs.</p> <p>Although the number of helicopters studied is too small to permit generally applicable conclusions the following are the primary results:</p> <p>The Effective Perceived Noise Levels tended to be overpredicted for takeoffs, underpredicted for approaches, with no general trend noted for level flyovers.</p> <p>Prediction accuracy for the cases studied ranged from 1 to 6 EPNdB.</p> <p>Test and measurement repeatability can give a range of up to 3 EPNdB.</p> <p>Each helicopter must be studied as an individual case and generalization of cost trends should be avoided.</p>			
17. Key Words		18. Distribution Statement  This document is available to the public through the National Technical Information Service, Springfield, Virginia 22161.	
19. Security Classif. (of this report)  Unclassified	20. Security Classif. (of this page)  Unclassified	21. No. of Pages  43	22. Price

1. Report No. FAA-EE-81-13	2. Government Accession No. ADA 103 724	3. Recipient's Catalog No.	
4. Title and Subtitle HELICOPTER NOISE ANALYSIS -- ROUND-ROBIN TEST		5. Report Date August 1981	
		6. Performing Organization Code DTS-331	
7. Author(s) Edward J. Rickley		8. Performing Organization Report No. DOT-TSC-FAA-81-13	
9. Performing Organization Name and Address U.S. Department of Transportation Research and Special Programs Administration Transportation Systems Center Cambridge MA 02142		10. Work Unit (No. (TRAIL) FA153/R1102	
		11. Contract or Grant No.	
12. Sponsoring Agency Name and Address U.S. Department of Transportation Federal Aviation Administration Office of Environment and Energy Washington DC 20591		13. Type of Report and Period Covered Final Report Jan. 1980 - May 1981	
		14. Sponsoring Agency Code AEE-120	
15. Supplementary Notes			
16. Abstract  <p>This report documents the results of an international Round Robin Test on the analysis of helicopter noise. Digital spectral noise data of a 3.5-second simulated helicopter flyover and identical analog test tapes containing helicopter noise data, reference signals, test tones and time code signals were sent to 13 participating organizations. The purpose of the test was to evaluate data reduction systems and procedures; to determine the magnitude of the variability between representative systems and organizations; and to identify potential causes and assist in establishing recommended procedures designed to minimize the variability.</p>			
17. Key Words Acoustic, Helicopter Noise, Aircraft Noise, Noise Analysis		18. Distribution Statement  DOCUMENT IS AVAILABLE TO THE PUBLIC THROUGH THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VIRGINIA 22161	
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1. Report No. DOT-FAA-EE-81-16	2. Government Accession No. ADA 116 363	3. Recipient's Catalog No.	
4. Title and Subtitle Helicopter Noise Definition Report: UH-60A, S-76, A-109, 206-L		5. Report Date December 1981	
		6. Performing Organization Code DOT/FAA	
7. Author(s) J. Steven Newman, *Edward J. Rickley, David W. Ford		8. Performing Organization Report No. DOT-FAA-EE-81-16	
9. Performing Organization Name and Address Department of Transportation Federal Aviation Administration Office of Environment and Energy (AEE-120) 800 Independence Ave., SW Washington, D.C. 20591		10. Work Unit No. (TRAIS)	
		11. Contract or Grant No.	
12. Sponsoring Agency Name and Address		13. Type of Report and Period Covered Final Report	
		14. Sponsoring Agency Code FAA/AEE	
15. Supplementary Notes *U.S. Department of Transportation, Transportation Systems Center, Kendall Square, Cambridge, Mass 02142			
16. Abstract This document presents noise data for the Sikorsky UH-60A Blackhawk, the Sikorsky S-76 Spirit, the Agusta A-109 and the Bell 206-L. The acoustical data are accompanied by phototheodolite tracking data, cockpit instrument panel photo data, and meteorological data acquired from radiosonde balloons. Acoustical metrics include both noise certification metrics (EPNL, PNL, PNL) as well as community/airport noise assessment metrics (SEL, dBA). Noise data have been acquired systematically to identify variations in level with variations in helicopter airspeed and altitude. Data contained in this report provide essential information for development of helicopter noise exposure contours as well as further evaluation of ICAO helicopter noise certification standards. Accordingly, this information will be of interest to helicopter manufacturers, airport planning consultants, acoustical engineers and airport managers. This report serves as a noise definition document establishing baseline acoustical characteristics of the test helicopters.			
17. Key Words Effective Perceived Noise Level (EPNL) Sound Exposure Level (SEL), Helicopter Noise, Helicopter, S-76, UH-60A, A-109, Bell 206-L, Heliport, Airport Noise Exposure, Helicopter Noise Contour		18. Distribution Statement This document is available to the U.S. public through the National Technical Information Service, Springfield, Virginia 22161	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages	22. Price

1. Report No. DOT-FAA-EE-82-16		2. Government Accession No. ADA 123 467		3. Recipient's Catalog No.	
4. Title and Subtitle Helicopter Noise Exposure Curves for use in Environmental Impact Assessment				5. Report Date November 1982	
				6. Performing Organization Code DOT/FAA	
				8. Performing Organization Report No. DOT-FAA-EE-82-16	
7. Author(s) J. Steven Newman, Edward J. Rickley <sup>1</sup> , Tyrone L. Bland <sup>2</sup>				10. Work Unit No. (TRAIS)	
9. Performing Organization Name and Address Department of Transportation Federal Aviation Administration Office of Environment and Energy, AEE-120 800 Independence Ave., SW Washington, D.C. 20591				11. Contractor or Grant No.	
				13. Type of Report and Period Covered  Final Report	
				14. Sponsoring Agency Code FAA/AEE	
12. Sponsoring Agency Name and Address					
15. Supplementary Notes 1. U.S. Department of Transportation, Transportation Systems Center, Kendall Square Cambridge, Mass 02142 2. Wilson Hill Associates, 1025 Vermont Ave., NW., Washington, D.C. 20005					
16. Abstract This report establishes the current (1982) FAA helicopter noise data base for use in environmental impact assessment. The report sets out assumptions, methodologies, and techniques used in arriving at noise-exposure-versus-distance relationships. Noise data are provided for 15 helicopters, including five flight regimes each: takeoff, approach, level flyover, hover in-ground-effect (HIGE) and hover out-of-ground effect (HOGE). When possible, level flyover data are presented for a variety of airspeeds. Sound exposure level (SEL) is provided for all operational modes except hover. In the case of hover operations (both HOGE and HIGE), the maximum A-Weighted Sound Level (L <sub>AM</sub> ) is identified as a function of distance. The report also includes a discussion of helicopter performance characteristics required for full computer modeling of helicopter/heliport noise exposure.					
17. Key Words Helicopter, Noise Exposure, Noise, Environmental Impact Assessment, Heliport, Noise Contour, INM, Airport/Heliport Planning			18. Distribution Statement This document is available to the U.S. public through the National Technical Information Service, Springfield, Virginia 22161 A-X(AS)-2		
19. Security Classif. (of this report) Unclassified		20. Security Classif. (of this page) Unclassified		21. No. of Pages 140	22. Price

1. Report No. FAA-EE-82-20	2. Government Accession No. ADA 123 856	3. Recipient's Catalog No.	
4. Title and Subtitle A Survey of Helicopter and Ambient Urban Noise Levels in Phoenix, Arizona		5. Report Date September 1982	
		6. Performing Organization Code DOT/FAA	
7. Author(s) J. Steven Newman		8. Performing Organization Report No. DOT-FAA-EE-82-20	
9. Performing Organization Name and Address Department of Transportation Federal Aviation Administration Office of Environment and Energy, AEE-120 800 Independence Ave., SW Washington, D.C. 20591		10. Work Unit No. (TRAIS)	
		11. Contract or Grant No.	
12. Sponsoring Agency Name and Address		13. Type of Report and Period Covered Final Report	
		14. Sponsoring Agency Code FAA/AEE	
15. Supplementary Notes			
16. Abstract <p>The FAA has been conducting controlled helicopter noise measurement programs since 1976. The data have been used for a variety of purposes including evaluation of proposed U.S. and international noise standards, validation of helicopter noise prediction methodologies, and development of practical heliport design guidance.</p> <p>In order to supplement the results of the controlled tests, field survey data are also being gathered to represent in-service operating conditions. Measurements are intended to represent helicopter noise within the context of urban ambient background noise. The results reported in this document are termed "survey measurements", as opposed to controlled test data, in order to reflect the limited control imposed over factors which contribute to the variability of measured noise levels.</p> <p>Noise data are presented for the Bell 206-L, Aerospatiale Alouette III, and the Aerospatiale A-Stare, SA-350. Operational modes include approach, takeoff, hover, and flat-pitch-idle. Noise data include A-Weighted Sound Level time histories, maximum A-Weighted Sound Level (<math>L_{ASm}</math>), Sound Exposure Level (<math>L_{AE}</math>), and Equivalent Sound Level (<math>L_{eq}</math>).</p>			
17. Key Words Helicopter, Noise, Noise Exposure 206-L, Alouette, A-Star, Environmental Noise Impact, Hover		18. Distribution Statement This document is available to the U.S. public through the National Technical Information Service, Springfield, Virginia 22161	
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1. Report No. DOT/FAA/CT-82/115	2. Government Accession No. ADA 176 077	3. Recipient's Catalog No.	
4. Title and Subtitle Handbook - Volume I, Validation of Digital Systems in Avionics and Flight Control Applications		5. Report Date July 1983 (Revised Sept. 1986)	
		6. Performing Organization Code	
7. Author(s) Hilt, Eldredge, Webb, Lucius, Bridgman		8. Performing Organization Report No.	
9. Performing Organization Name and Address Batelle Columbus Laboratories Columbus, Ohio 43201		10. Work Unit No. (TRAIS)	
		11. Contract or Grant No.	
12. Sponsoring Agency Name and Address U.S. Department of Transportation Federal Aviation Administration Technical Center Atlantic City Airport, New Jersey 08405		13. Type of Report and Period Covered  Handbook	
		14. Sponsoring Agency Code	
15. Supplementary Notes			
16. Abstract  The purpose of this handbook is to identify techniques, methodologies, tools, and procedures in a systems context that may be applicable to aspects of the validation and certification of digital systems at specific times in the development, and implementation of software based digital systems to be used in flight control/avionics applications. The application of these techniques in the development of discrete units and/or systems will result in completion of a product or system which is verifiable and can be validated in the context of the existing regulations/orders of the government regulatory agencies. The handbook uses a systems engineering approach to the implementation and testing of software and hardware during the design, development, and implementation phases. The handbook also recognizes and provides for the evaluation of the pilot's workload in the utilization of the new control/display technology, especially when crew recognition and intervention may be necessary to cope with/recover from the effects of faults or failures in the digital systems or the crew introduces errors into the system under periods of high workload due to some inadvertent procedure or entry of incorrect or erroneous data.  (Volume II of this Handbook is Report DOT/FAA/CT-88/10)			
17. Key Words Avionics, Digital, Validation, Certification, Fault Tolerance, Lighting, Electromagnetic interference, Workload, Modeling		18. Distribution Statement This document is available to the public through the National Technical Information Service Springfield, VA 22161	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 510	22. Price

1. Report No. FAA-EE-83-2	2. Government Accession No. ADA 129 167	3. Recipient's Catalog No.	
4. Title and Subtitle Helicopter Noise Survey at Selected New York City Heliports FAA-EE-83-2		5. Report Date March 1983	
		6. Performing Organization Code	
7. Author(s) E. J. Rickley, M. J. Brien, and Steven R. Albersheim		8. Performing Organization Report No.	
9. Performing Organization Name and Address Department of Transportation Transportation Systems Center Cambridge, MA 02142		10. Work Unit No. (TRAIS)	
		11. Contract or Grant No.	
12. Sponsoring Agency Name and Address Department of Transportation Federal Aviation Administration Office of Environment and Energy, AEE-110 Washington, D.C. 20591		13. Type of Report and Period Covered	
		14. Sponsoring Agency Code	
15. Supplementary Notes			
16. Abstract <p>The FAA conducted a noise measurement survey of helicopter operations at three principal heliports in the borough of Manhattan in New York City on November 16-17, 1982. The purpose was to gather needed information for defining noise problems with in-service helicopter operations within urban areas. These noise data will be used to further define the environmental problems associated with helicopter operations in urban areas.</p> <p>Statistical community noise level data, measured over an 8-hour period at each selected site, are provided which reflect the noise levels at these sites from all local sources during that particular day. Noise data from individual helicopter operations are also provided. These data from helicopter "targets of opportunity" are termed "survey data" as opposed to "controlled test data" in order to reflect the limited control over factors which contribute to the variability of the measured noise level. Noise data are presented for the Augusta A-109, Bell 47J, Bell 206L, Bell 222, Bcelkow B-105, and Sikorsky S-76.</p>			
17. Key Words Helicopters, Community Noise, Environmental Noise Impact, Leq.		18. Distribution Statement  This document is available to the public through the National Information Service, Springfield, VA 22161	
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1. Report No. FAA-EE-83-5	2. Government Accession No. ADA 130 962	3. Recipient's Catalog No.	
4. Title and Subtitle Helicopter Noise Survey Performed at Parker Center, Pasadena, and Anaheim California on February 10-14, 1983		5. Report Date June 1983	6. Performing Organization Code
		8. Performing Organization Report No.	
7. Author(s) Steven R. Albersheim		10. Work Unit No. (TRAIS)	
9. Performing Organization Name and Address Department of Transportation Federal Aviation Administration, Office of Environment and Energy, AEE-110, Washington, D.C. 20591		11. Contract or Grant No.	
		13. Type of Report and Period Covered	
12. Sponsoring Agency Name and Address Department of Transportation, Federal Aviation Administration, Office of Environment and Energy, AEE-110, Washington, D.C. 20591		14. Sponsoring Agency Code	
		15. Supplementary Notes	
<p>16. Abstract</p> <p>The FAA conducted a noise measurement survey of helicopter operations at three different helipads in the Los Angeles metropolitan area during the period of February 10-14, 1983. The purpose was to gather needed information for defining noise problems with in-service helicopter operations in a suburban and urban area.</p> <p>Noise level data were sampled for a variety of helicopters for different operating conditions and land use characteristics. The data collected reflect noise levels at these sites from all local sources of noise during that particular sampling period. These data from helicopter "targets of opportunity" are termed "survey data" as opposed to "controlled test data" in order to reflect the limited control over factors which contribute to the variability of the measured noise level.</p>			
17. Key Words  Helicopters, $L_{MAX}$ , $L_{eq}$ , Environmental Noise Impact		18. Distribution Statement  This document is available to the public through the National Technical Information Service, Springfield, VA 22161	
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1. Report No. FAA-EE-83-6	2. Government Accession No. ADA 131 053	3. Recipient's Catalog No.	
4. Title and Subtitle Helicopter Noise Survey Conducted at Norwood Massachusetts on April 27, 1983		5. Report Date June 1983	
		6. Performing Organization Code	
7. Author(s) Steven R. Albersheim		8. Performing Organization Report No.	
9. Performing Organization Name and Address U.S. Department of Transportation Federal Aviation Administration, Office of Environment and Energy, AEE-110 Washington, D.C. 20591		10. Work Unit No. (TRAIS)	
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12. Sponsoring Agency Name and Address U. S. Department of Transportation Federal Aviation Administration, Office of Environment and Energy, AEE-110, Washington, D.C. 20591		13. Type of Report and Period Covered	
		14. Sponsoring Agency Code	
15. Supplementary Notes			
16. Abstract <p>The FAA conducted a noise measurement survey of helicopter operations at Norwood, Massachusetts on April 27, 1983. The purpose was to gather needed information for defining noise problems with in-service helicopter operations at a general aviation airport in a suburban area.</p> <p>Noise level data were sampled over a period of approximately 3 hours. The data collected reflect noise levels at two different residential sites from all local source of noise during that particular sampling period. These data from helicopter "target of opportunity" are termed "survey data" as opposed to "controlled test data" in order to reflect the limited control factors which contribute to the variability of the measured noise.</p>			
17. Key Words helicopters, General Aviation Aircraft, Environmental Noise Impact, Leq, L <sub>MAX</sub>		18. Distribution Statement  This document is available to the public through the National Technical Infor- mation Service, Springfield, VA 22161	
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1. Report No. FAA-EE-84-1	2. Government Accession No. ADA 139 906	3. Recipient's Catalog No.	
4. Title and Subtitle Noise Measurement Flight Test for the Bell 222 Twin Jet Helicopter: Data and Analyses		5. Report Date February 1984	
		6. Performing Organization Code	
		8. Performing Organization Report No.	
7. Author(s) J. Steven Newman, Edward J. Rickley(1) Tyrone L. Bland, Sharon A. Daboin		10. Work Unit No. (TRAIS)	
9. Performing Organization Name and Address Federal Aviation Administration, Office of Environment and Energy, Noise Abatement Division, Noise Technology Branch, (AEE-120), 800 Independence Ave., SW Washington, DC 20591		11. Contract or Grant No.	
		13. Type of Report and Period Covered	
12. Sponsoring Agency Name and Address Federal Aviation Administration, Office of Environment and Energy, Noise Abatement Division, Noise Technology Branch, (AEE-120), 800 Independence Ave., SW Washington, DC 20591		14. Sponsoring Agency Code	
15. Supplementary Notes (1) U.S. Department of Transportation, Transportation Systems Center, Kendall Square, Cambridge, Mass 02142			
16. Abstract <p>This report documents the results of a Federal Aviation Administration (FAA) noise measurement flight test program with the Bell 222 twin-jet helicopter. The report contains documentary sections describing the acoustical characteristics of the subject helicopter and provides analyses and discussions addressing topics ranging from acoustical propagation to environmental impact of helicopter noise.</p> <p>This report is the first in a series of seven documenting the FAA helicopter noise measurement program conducted at Dulles International Airport during the summer of 1983. The Bell 222 test program involved the acquisition of detailed acoustical, position and meteorological data.</p> <p>This test program was designed to address a series of objectives including:</p> <p>1) evaluation of "Fly Neighborly" (minimum noise) operating procedures for helicopters, 2) acquisition of acoustical data for use in heliport environmental impact, 3) documentation of directivity characteristics for static operation of helicopters, 4) establishment of ground-to-ground and air-to-ground acoustical propagation relationships for helicopters, 5) determination of noise event duration influences on energy dose acoustical metrics, 6) examination of the differences between noise measured by a surface mounted microphone and a microphone mounted at a height of four feet (1.2 meters), and 7) documentation of noise levels acquired using international helicopter noise certification test procedures.</p>			
17. Key Words helicopter, noise, Bell 222, heliport environmental impact, directivity, noise certification standards		18. Distribution Statement This document is available to the public through the National Technical Information Service, Springfield, VA 22161	
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1. Report No. FAA-EE-84-2	2. Government Accession No. ADA 143 229	3. Recipient's Catalog No.	
4. Title and Subtitle Noise Measurement Flight Test for Aerospatiale SA 354N Dauphin 2 Twin Jet Helicopter: Data and Analyses		5. Report Date April 1984	
		6. Performing Organization Code	
		8. Performing Organization Report No.	
7. Author(s) J. Steven Newman, Edward J. Rickley(1) Sharon A. Daboin, Kristy R. Beattie			
9. Performing Organization Name and Address Federal Aviation Administration, Office of Environment and Energy, Noise Abatement Division, Noise Technology Branch, (AEE-120), 800 Independence Ave., SW Washington, DC 20591		10. Work Unit No. (TRAIS)	
		11. Contract or Grant No.	
		13. Type of Report and Period Covered	
12. Sponsoring Agency Name and Address Federal Aviation Administration, Office of Environment and Energy, Noise Abatement Division, Noise Technology Branch, (AEE-120), 800 Independence Ave., SW Washington, DC 20591		14. Sponsoring Agency Code	
15. Supplementary Notes (1) U.S. Department of Transportation, Transportation Systems Center, Kendall Square, Cambridge, Mass 02142			
16. Abstract <p>This report documents the results of a Federal Aviation Administration (FAA) noise measurement flight test program with the Dauphin twin-jet helicopter. The report contains documentary sections describing the acoustical characteristics of the subject helicopter and provides analyses and discussions addressing topics ranging from acoustical propagation to environmental impact of helicopter noise.</p> <p>This report is the second in a series of seven documenting the FAA helicopter noise measurement program conducted at Dulles International Airport during the summer of 1983. The Dauphin test program involved the acquisition of detailed acoustical, position and meteorological data.</p> <p>This test program was designed to address a series of objectives including:</p> <ol style="list-style-type: none"> <li>1) acquisition of acoustical data for use in assessing heliport environment impact,</li> <li>2) documentation of directivity characteristics for static operation of helicopters,</li> <li>3) establishment of ground-to-ground and air-to-ground acoustical propagation relationships for helicopters,</li> <li>4) determination of noise event duration influences on energy dose acoustical metrics,</li> <li>5) examination of the differences between noise measured by a surface mounted microphone and a microphone mounted at a height of four feet (1.2 meters), and</li> <li>6) documentation of noise levels acquired using international helicopter noise certification test procedures.</li> </ol>			
17. Key Words helicopter, noise, Dauphin, heliport environmental impact, directivity, noise certification standards		18. Distribution Statement This document is available to the public through the National Technical Information Service, Springfield, VA 22161	
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1. Report No. FAA-84-3	2. Government Accession No. ADA 148 110	3. Recipient's Catalog No.	
4. Title and Subtitle Noise Measurement Flight Test for Hughes 500D/E: Data and Analyses		5. Report Date May 1984	6. Performing Organization Code
		8. Performing Organization Report No.	
7. Author(s) J. Steven Newman, Edward J. Rickley(1) Kristy R. Beattie (2), Tyrone L. Bland (2)		10. Work Unit No. (TRAIS)	11. Contract or Grant No.
9. Performing Organization Name and Address Federal Aviation Administration, Office of Environment and Energy, Noise Abatement Division, Noise Technology Branch, (AEE-120), 800 Independence Ave., SW Washington, DC 20591		13. Type of Report and Period Covered	
		14. Sponsoring Agency Code	
12. Sponsoring Agency Name and Address Federal Aviation Administration, Office of Environment and Energy, Noise Abatement Division, Noise Technology Branch, (AEE-120), 800 Independence Ave., SW Washington, DC 20591			
15. Supplementary Notes (1) U.S. Department of Transportation, Transportation Systems Center, Kendall Square, Cambridge MA 02142 (2) ORI, Inc. 1400 Spring St., Silver Spring, MD 20910			
16. Abstract This report documents the results of a Federal Aviation Administration (FAA) noise measurement flight test program with the Hughes 500D/E helicopter. The report contains documentary sections describing the acoustical characteristics of the subject helicopter and provides analyses and discussions addressing topics ranging from acoustical propagation to environmental impact of helicopter noise.  This report is the third in a series of seven documenting the FAA helicopter noise measurement program conducted at Dulles International Airport during the summer of 1983. The Hughes 500D/E test program involved the acquisition of detailed acoustical, position and meteorological data.  This test program was designed to address a series of objectives including: 1) acquisition of acoustical data for use in assessing heliport environmental impact, 2) documentation of directivity characteristics for static operation of helicopters, 3) establishment of ground-to-ground and air-to-ground acoustical propagation relationships for helicopters, 4) determination of noise event duration influences on energy dose acoustical metrics, 5) examination of the differences between noise measured by a surface mounted microphone and a microphone mounted at a height of four feet (1.2 meters), and 6) documentation of noise levels acquired using international helicopter noise certification test procedures.			
17. Key Words helicopter, noise, Hughes, heliport environmental impact, directivity, noise certification standards		18. Distribution Statement This document is available to the public through the National Technical Information Service, Springfield, VA 22161	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 180	22. Price

1. Report No. FAA-EE-84-04	2. Government Accession No. ADA 147 497	3. Recipient's Catalog No.	
4. Title and Subtitle Noise Measurement Flight Test for Aerospatiale AS 355F TwinStar Helicopter: Data/Analyses		5. Report Date August 1984	
		6. Performing Organization Code	
7. Author(s) J. Steven Newman, Edward J. Rickley (1) Kristy R. Beattie (2), Tyrone L. Bland (2)		8. Performing Organization Report No.	
9. Performing Organization Name and Address Federal Aviation Administration, Office of Environment and Energy, Noise Abatement Division, Noise Technology Branch, (AEE-120), 800 Independence Ave., SW Washington, DC 20591		10. Work Unit No. (TRAIS)	
		11. Contract or Grant No.	
12. Sponsoring Agency Name and Address Federal Aviation Administration, Office of Environment and Energy, Noise Abatement Division, Noise Technology Branch, (AEE-120), 800 Independence Ave., SW Washington, DC 20591		13. Type of Report and Period Covered	
		14. Sponsoring Agency Code	
15. Supplementary Notes (1) U.S. Department of Transportation, Transportation Systems Center, Kendall Square, Cambridge, Mass 021142 (2) ORI, Inc., 1375 Piccard Drive, Rockville, MD 20850			
16. Abstract This report documents the results of a Federal Aviation Administration (FAA) noise measurement flight test program with the TwinStar twin-jet helicopter. The report contains documentary sections describing the acoustical characteristics of the subject helicopter and provides analyses and discussions addressing topics ranging from acoustical propagation to environmental impact of helicopter noise.  This report is the fourth in a series of seven documenting the FAA helicopter noise measurement program conducted at Dulles International Airport during the summer of 1983. The TwinStar test program involved the acquisition of detailed acoustical, position and meteorological data.  This test program was designed to address a series of objectives including: 1) acquisition of acoustical data for use in assessing heliport environmental impact, 2) documentation of directivity characteristics for static operation of helicopters, 3) establishment of ground-to-ground and air-to-ground acoustical propagation relationships for helicopters, 4) determination of noise event duration influences on energy dose acoustical metrics, 5) examination of the differences between noise measured by a surface mounted microphone and a microphone mounted at a height of four feet (1.2 meters), and 6) documentation of noise levels acquired using international helicopter noise certification test procedures.			
17. Key Words helicopter, noise, TwinStar, heliport Environmental impact, directivity, noise certification standards		18. Distribution Statement This document is available to the public through the National Technical Information Service, Springfield, VA 22161	
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1. Report No. FAA-EE-84-05	2. Government Accession No. ADA 148 496	3. Recipient's Catalog No.	
4. Title and Subtitle Noise Measurement Flight Test for Aerospatiale AS 350D AStar Helicopter Data and Analyses		5. Report Date September 1984	
		6. Performing Organization Code	
7. Author(s) J. Steven Newman, Edward J. Rickley (1) Kristy R. Beattie (2), Tyrone L. Bland (2)		8. Performing Organization Report No.	
9. Performing Organization Name and Address Federal Aviation Administration, Office of Environment and Energy, Noise Abatement Division, Noise Technology Branch, (AEE-120), 800 Independence Ave., S.W. Washington, D.C. 20591		10. Work Unit No. (TRAIS)	
		11. Contract or Grant No.	
12. Sponsoring Agency Name and Address Federal Aviation Administration, Office of Environment and Energy, Noise Abatement Division, Noise Technology Branch, (AEE-120), 800 Independence Ave., S.W. Washington, D.C. 20591		13. Type of Report and Period Covered	
		14. Sponsoring Agency Code	
15. Supplementary Notes (1) U.S. Department of Transportation, Transportation Systems Center, Kendall Square Cambridge, Mass 02142 (2) ORI, Inc., 1375 Piccard Drive, Rockville, MD 20850			
16. Abstract This report documents the results of a Federal Aviation Administration (FAA) noise measurement flight test program with the AStar helicopter. The report contains documentary sections describing the acoustical characteristics of the subject helicopter and provides analyses and discussions addressing topics ranging from acoustical propagation to environmental impact of helicopter noise.  This report is the fifth in a series of seven documenting the FAA helicopter noise measurement program conducted at Dulles International Airport during the summer of 1983. The AStar test program involved the acquisition of detailed acoustical, position and meteorological data.  This program was designed to address a series of objectives including: 1) acquisition of acoustical data for use in assessing heliport environmental impact 2) documentation of directivity characteristics for static operation of helicopters, 3) establishment of ground-to-ground and air-to-ground acoustical propagation relationships for helicopters, 4) determination of noise event duration influences on energy dose acoustical metrics, 5) examination of the differences between noise measured by a surface mounted microphone and a microphone mounted at a height of four feet (1.2 meters), and 6) documentation of noise levels acquired using international helicopter noise certification test procedures.			
17. Key Words helicopter, noise, AStar, heliport environmental impact, directivity, noise certification standards		18. Distribution Statement This document is available to the public through the National Technical Information Service, Springfield, VA 22161	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 175	22. Price

1. Report No. FAA-EE-84-6	2. Government Accession No. ADA 148 525	3. Recipient's Catalog No.	
4. Title and Subtitle Noise Measurement Flight Test for Sikorsky S-76A Helicopter: Data and Analyses		5. Report Date September 1984	
		6. Performing Organization Code	
		8. Performing Organization Report No.	
7. Author(s) J. Steven Newman, Edward J. Rickley (1), Tyrone L. Bland (2), Kristy R. Beattie (2)		10. Work Unit No. (TRAIS)	
9. Performing Organization Name and Address Federal Aviation Administration, Office of Environment and Energy, Noise Abatement Division, Noise Technology Branch, (AEE-120), 800 Independence Ave., SW Washington, DC 20591		11. Contract or Grant No.	
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12. Sponsoring Agency Name and Address Federal Aviation Administration, Office of Environment and Energy, Noise Abatement Division, Noise Technology Branch, (AEE-120), 800 Independence Ave., SW Washington, DC 20591		14. Sponsoring Agency Code	
		15. Supplementary Notes (1) U.S. Department of Transportation Systems Center, Kendall Square, Cambridge, Mass. 02142 (2) ORI, Inc. 1375 Piccard Drive, Rockville, Maryland 20850	
16. Abstract This report documents the results of a Federal Aviation Administration (FAA) noise measurement flight test program with the Sikorsky S-76 helicopter. The report contains documentary sections describing the acoustical characteristics of the subject helicopter and provides analyses and discussions addressing topics ranging from acoustical propagation to environmental impact of helicopter noise.  This report is the sixth in a series of seven documenting the FAA helicopter noise measurement program conducted at Dulles International Airport during the summer of 1983. The S-76 test program involved the acquisition of detailed acoustical, position and meteorological data.  This test program was designed to address a series of objectives including: 1) acquisition of acoustical data for use in assessing heliport environment impact, 2) documentation of directivity characteristics for static operation of helicopters, 3) establishment of ground-to-ground and air-to-ground acoustical propagation relationships for helicopters, 4) determination of noise event duration influences on energy dose acoustical metrics, 5) examination of the differences between noise measured by a surface mounted microphone and a microphone mounted at a height of four feet (1.2 meters), and 6) documentation of noise levels acquired using international helicopter noise certification test procedures.			
17. Key Words helicopter, noise, Sikorsky, heliport, environmental impact, directivity, noise certification standards		18. Distribution Statement This document is available to the public through the National Technical Information Service, Springfield, VA 22161	
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1. Report No. FAA-EE-84-7	2. Government Accession No. ADA 148 172	3. Recipient's Catalog No.	
4. Title and Subtitle Noise Measurement Flight Test for Boeing Vertol 234/ CH 4 -D Helicopter: Data/Analyses		5. Report Date September 1984	
		6. Performing Organization Code	
7. Author(s) J. Steven Newman; Edward J. Rickley (1), Tyrone L. Bland (2), Kristy R. Beattie (2)		8. Performing Organization Report No.	
9. Performing Organization Name and Address Federal Aviation Administration, Office of Environment and Energy, Noise Abatement Division, Noise Technology Branch, (AEE-120), 800 Independence Ave., SW Washington, DC 20591		10. Work Unit No. (TRAIS)	
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12. Sponsoring Agency Name and Address Federal Aviation Administration, Office of Environment and Energy, Noise Abatement Division, Noise Technology Branch, (AEE-120), 800 Independence Ave., SW Washington, DC 20591		13. Type of Report and Period Covered	
		14. Sponsoring Agency Code	
15. Supplementary Notes (1) U.S. Department of Transportation Systems Center, Kendall Square, Cambridge, Mass. 02142 (2) ORI, Inc. 1375 Piccard Drive, Rockville, Maryland 20850			
16. Abstract This report documents the results of a Federal Aviation Administration (FAA) noise measurement flight test program with the Boeing-Vertol CH-47D helicopter. The report contains documentary sections describing the acoustical characteristics of the subject helicopter and provides analyses and discussions addressing topics ranging from acoustical propagation to environmental impact of helicopter noise.  This report is the seventh in a series of seven documenting the FAA helicopter noise measurement program conducted at Dulles International Airport during the summer of 1983. The BV234/CH-47D test program involved the acquisition of detailed acoustical, position and meteorological data.  This test program was designed to address a series of objectives including: 1) acquisition of acoustical data for use in assessing heliport environment impact, 2) documentation of directivity characteristics for static operations of helicopters, 3) establishment of ground-to-ground and air-to-ground acoustical propagation relationships for helicopters, 4) determination of noise event duration influences on energy dose acoustical metrics, 5) examination of the differences between noise measured by a surface mounted microphone and a microphone mounted at a height of four feet (1.2 meters), and 6) documentation of noise levels acquired using international helicopter noise certification test procedures.			
17. Key Words helicopter, noise, Boeing-Vertol, heliport, environmental impact, directivity, noise certification standards		18. Distribution Statement This document is available to the public through the National Technical Information Service, Springfield, VA 22161	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 190	22. Price

Technical Report Documentation Page

1. Report No. FAA-EE-84-15	2. Government Accession No. ADA 147 392	3. Recipient's Catalog No.	
4. Title and Subtitle Helicopter Noise Survey Performed at Las Vegas, January 19-21, 1984		5. Report Date	
		6. Performing Organization Code	
7. Author(s) Steven R. Albersheim		8. Performing Organization Report No.	
9. Performing Organization Name and Address Department of Transportation, Federal Aviation Administration, Office of Environment and Energy, AEE-110, Washington, D.C. 20591		10. Work Unit No. (TRAIS)	
		11. Contract or Grant No.	
12. Sponsoring Agency Name and Address Department of Transportation, Federal Aviation Administration, Office of Environment and Energy, AEE-110, Washington, D.C. 20591		13. Type of Report and Period Covered	
		14. Sponsoring Agency Code	
15. Supplementary Notes			
16. Abstract <p>The FAA conducted a noise measurement survey of helicopter operations at Las Vegas during the Annual Helicopter Association International Convention. The survey was performed during the period of January 19-21, 1984. The purpose of this noise survey was to obtain additional noise data for a number of different helicopter models during normal operations in an urban environment. This survey was the first test program which measured sideline noise levels beyond 500 feet. The data collected are classified as survey type data, since the data obtained were from "target of opportunity" as apposed to "controlled test data."</p>			
17. Key Words Helicopter, $L_{MAX}$ , $L_{EQ}$ , environmental noise impact		18. Distribution Statement This document is available to the public through the National Technical Information Service, Springfield, VA 22161	
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# Technical Report Documentation Page

1. Report No. FAA-EE-85-3	2. Government Accession No. ADA 154 893	3. Recipient's Catalog No.	
4. Title and Subtitle HELICOPTER NOISE SURVEY FOR SELECTED CITIES IN THE CONTIGUOUS UNITED STATES		5. Report Date MARCH 20, 1985	
		6. Performing Organization Code	
7. Author(s) ROBERT MAIN, ANDREW JOSHI, DAVID COUTS, AND LESLIE HILTEN		8. Performing Organization Report No.	
9. Performing Organization Name and Address MANDEX INC., 2106b GALLOWES ROAD VIENNA, VA. 22108		10. Work Unit No. (TRAIS)	
		11. Contract or Grant No.	
12. Sponsoring Agency Name and Address FEDERAL AVIATION ADMINISTRATION OFFICE OF ENVIRONMENT AND ENERGY 800 INDEPENDENCE AVENUE, SW. WASHINGTON, D.C. 20591		13. Type of Report and Period Covered	
		14. Sponsoring Agency Code	
15. Supplementary Notes TECHNICAL MANAGER - STEVEN ALBERSHEIM			
16. Abstract THE FAA HAS CONDUCTED A SERIES OF NOISE SURVEYS IN THE FOLLOWING URBAN AREAS: CHICAGO, IL; LONG BEACH, CA; NEW ORLEANS, LA; PORTLAND, OR; AND SEATTLE, WA. IN EACH METROPOLITAN AREA, NOISE MEASUREMENTS WERE MADE AT THREE OR FOUR HELIPORTS OR HELIPADS. LAND USE SURROUNDING THE HELIPORTS RANGED FROM RESIDENTIAL TO INDUSTRIAL. NOISE LEVELS FOR $L_{max}$ WERE RECORDED DURING EACH TEST AT EACH HELIPORT ALSO RECORDED WERE AMBIENT NOISE LEVELS WHICH WERE USED AS A BASIS FOR COMPARISON OF NOISE ASSOCIATED WITH HELICOPTER OPERATIONS VERSUS URBAN BACKGROUND NOISE LEVELS.			
17. Key Words $L_{max}$ , AMBIENT NOISE, HELICOPTER NOISE LAND USE		18. Distribution Statement THIS DOCUMENT IS AVAILABLE TO THE U.S. PUBLIC THROUGH THE NATIONAL TECHNICAL INFORMATION SERVICE SPRINGFIELD, VA, 22161	
19. Security Classif. (of this report) unclassified	20. Security Classif. (of this page) unclassified	21. No. of Pages 303	22. Price

1. Report No. FAA-EE-85-6	2. Government Accession No. ADA 159 898	3. Recipient's Catalog No.	
4. Title and Subtitle International Civil Aviation Organization Helicopter Noise Measurement Repeatability Program: U.S. Test Report, Bell 206L-1, Noise Measurement Flight Test		5. Report Date September 1985	
		6. Performing Organization Code	
7. Author(s) J. Steven Newman, Edward J. Rickley(1), Maryalice Locke(2)		8. Performing Organization Report No.	
9. Performing Organization Name and Address Federal Aviation Administration, Office of Environment and Energy, Noise Abatement Division, Noise Technology Branch (AEE-120), 800 Independence Ave. S.W., Washington, D.C. 20591		10. Work Unit No. (TRAIS)	
		11. Contract or Grant No.	
12. Sponsoring Agency Name and Address Federal Aviation Administration, Office of Environment and Energy, Noise Abatement Division, Noise Technology Branch (AEE-120), 800 Independence Ave. S.W., Washington, D.C. 20591		13. Type of Report and Period Covered	
		14. Sponsoring Agency Code	
15. Supplementary Notes (1) U.S. DOT Transportation Systems Center, Kendall Square, Cambridge, MA 02142 (2) ORI, Inc., 1375 Piccard Drive, Rockville, MD 20850			
16. Abstract This document reports the findings of the U.S. test team's participation in the Helicopter Noise Measurement Repeatability Program (HNMRP) conducted under the direction of the International Civil Aviation Organization's (ICAO) Committee on Aviation Environmental Problems (CAEP) Working Group II (WG II). The FAA, as the U.S. test team, conducted the HNMRP noise measurement flight test program in concert with a separate measurement team from Canada. The U.S./Canadian flight test was held in August of 1984 at Dulles International Airport near Washington, D.C. The principal objective of this international HNMRP is to refine noise certification testing requirements. Participating nations conducted the test programs on the same type helicopter, the Bell 206L-1 (or the acoustically equivalent 206L-3), using the same test procedures. Analyses in this document include the investigation of source noise adjustments based on increases in noise level with advancing blade tip Mach number, the examination of relative source contributions in the helicopter acoustical spectrum, and source directivity for both in-flight and static operations. This report contains helicopter noise definition information (useful in environmental impact analyses) for level flyovers at various airspeeds and altitudes, and ICAO takeoff and approach procedures. Data are also shown for a noise abatement operation involving dynamic changes in torque, rate of descent and airspeed. This report also provides information for the hover-in-ground effect, flight idle and ground idle static operations. The results reported in this document will be combined with those of other HNMRP participant nations for evaluation by CAEP WG II.			
17. Key Words helicopter noise international noise standards ICAO/CAEP flight test		18. Distribution Statement This document is available to the public through the National Technical Information Service, Springfield, VA 22161	
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1. Report No. FAA-EE-85-7	2. Government Accession No. ADA 159 835	3. Recipient's Catalog No.	
4. Title and Subtitle Flight Operations Noise Tests of Eight Helicopters		5. Report Date August 1985	
		6. Performing Organization Code	
7. Author(s) Sharon A. Yoshikami		8. Performing Organization Report No.	
9. Performing Organization Name and Address Federal Aviation Administration, Office of Environment and Energy, Noise Abatement Division, Noise Technology Branch (AEE-120), 800 Independence Ave., SW, Washington, DC 20591		10. Work Unit No. (TRAIS)	
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12. Sponsoring Agency Name and Address Federal Aviation Administration, Office of Environment and Energy, Noise Abatement Division, Noise Technology Branch (AEE-120), 800 Independence Ave., SW Washington, DC 20591		13. Type of Report and Period Covered	
		14. Sponsoring Agency Code	
15. Supplementary Notes			
16. Abstract <p>This document presents acoustical data and flight path information acquired during the FAA/HAI Helicopter Flight Operations Noise Test Program. "As-measured" noise levels of the Aerospatiale 365N, Agusta 109A, Bell 206L-1 and 222A, Hughes 500D, MBB BK117, Robinson R22, and Sikorsky S76 are presented for various enroute and heliport flight operations. These operations include level flyovers at two altitudes, normal takeoffs, normal and constant-gildeslope approaches, various types of noise abatement approaches, level flight turns and hover (IGE and OGE). The acoustical data are accompanied by radar tracking data and cockpit instrument panel information which document the operational procedures flown, and meteorological measurements to permit data corrections for nonstandard atmospheric conditions. This helicopter operational noise data base can be used in enroute and heliport land use planning, heliport environmental studies and planning guidelines, pilot familiarization and training, verification of noise prediction and estimating methods, and lateral attenuation studies.</p>			
17. Key Words helicopter, noise, heliport, flight operations, noise abatement, directivity approaches		18. Distribution Statement This document is available to the public through the National Technical Information Service, Springfield, VA 22161	
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		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s)  Paul D. Schomer Robert D. Neathammer		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS  U.S. Army Construction Engr Research Laboratory P.O. Box 4005 Champaign, IL 61820-1305		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS  DTFA 01834-10543
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19. KEY WORDS (Continue on reverse side if necessary and identify by block number)  helicopters noise pollution vibration rattle		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number)  The understanding of community reaction to helicopter noise remains incomplete. A technique called "A-weighting" appears to produce realistic data outdoors and at modest noise levels, and the community response in terms of percentage of population highly annoyed can be correlated with respect to the Day/Night Average Sound Level (DNL) descriptor. However, questions remain as to the effect of perceived building vibration and rattle on human response to helicopter noise. Does hearing windows, ceiling tiles, or objects in the room rattle or the general perception of building vibration increase the public's adverse response to helicopter noise? To answer these questions,		

BLOCK 20 (Cont'd)

CERL TR N-85/14

this study examined the role of vibration and rattle in human response to helicopter noise.

Many volunteer subjects were tested under real noise conditions. The helicopter noise was generated by an Army UH-1H (Huey) helicopter. Subjects were located either in the living room of a new mobile home, outdoors, or in the living room or dining room of an old frame farmhouse near Champaign, IL. The control or comparison sound was generated electronically through loudspeakers at each location using a 500-Hz octave band of white noise. By performing paired comparison tests between the helicopter and control noises, it was possible to establish equivalency between these two stimuli. The subjects did not know that the role of vibration and rattle was the test's true purpose. USA-CERL researchers and USA-CERL instruments recorded the vibration and rattle levels; the subjects judged only their annoyance to the helicopter noise versus the control noise.

Results showed that the A-frequency-weighting is adequate to assess community response to helicopter noise when no vibration or rattle is induced by the noise and the A-weighted sound exposure level is less than 90 dB. When rattle or vibration is induced by the helicopter noise, however, A-weighting does not assess the community response adequately. Under conditions of "a little" rattle or vibration induced by the helicopter noise, an offset of about 10 dB appears necessary to properly account for community reaction to helicopter noise. When "a lot" of rattle or vibration is induced, the offset necessary to use A-weighting appears to be on the order of 20 dB or more. Moreover, C-weighting offers little or no improvement over A-weighting; the subjective response data still divide based on the levels of vibration and rattle induced by the noise.

In this study, slant distance (distance of closest approach between the helicopter and the location on the ground) offers the best correlation with high levels of rattle. For slant distances in excess of 1000 ft, high levels of rattle usually would not be induced and for slant distances shorter than 500 ft, high levels of rattle would nearly always be produced.

The result suggests a decibel offset of perhaps 5 to 10 dB to assess helicopter noise properly when little vibration or rattle is produced by the noise or when no rattle is produced and the helicopter sound exposure level (SEL) is very high, exceeding about 90 dB. With no rattles and at lower helicopter SELs, there is no offset. No housing or noise-sensitive land uses should be located in zones where high levels of vibration or rattle are induced by helicopter noise; the offset is at least on the order of 20 dB. This high vibration and rattle zone potentially can be delineated by helicopter type and slant distance. For the Army Huey aircraft in level flyover, this zone boundary is at a slant distance somewhere between 500 and 1000 ft. The slant distance zone boundary is expected to differ with type of aircraft and operation.

1. Report No. FAA-EE-86-01	2. Government Accession No. ADA 167 446	3. Recipient's Catalog No.	
4. Title and Subtitle Analysis of Helicopter Noise Data Using International Helicopter Noise Certification Procedures		5. Report Date March 1986	
		6. Performing Organization Code	
7. Author(s) J. Steven Newman, Edward J. Rickley (1), Dennis A. Levanduski (2), Susan B. Woolridge (2)		8. Performing Organization Report No.	
9. Performing Organization Name and Address Federal Aviation Administration, Office of Environment and Energy, Noise Abatement Division, Noise Technology Branch, (AEE-120), 800 Independence Ave., SW Washington, DC 20591		10. Work Unit No. (TRAIS)	
		11. Contract or Grant No.	
12. Sponsoring Agency Name and Address Federal Aviation Administration, Office of Environment and Energy, Noise Abatement Division, Noise Technology Branch, (AEE-120), 800 Independence Ave., SW Washington, DC 20591		13. Type of Report and Period Covered	
		14. Sponsoring Agency Code	
15. Supplementary Notes (1) U.S. DOT, Transportation Systems Center, Kendall Square, Cambridge, Mass 02142 (2) ORI, Inc., 1375 Piccard Drive, Rockville, MD 20850			
16. Abstract  This report documents the results of a Federal Aviation Administration (FAA) noise measurement flight test program involving seven helicopters and establishes noise levels using the basic testing, reduction and analysis procedures specified by the International Civil Aviation Organization (ICAO) for helicopter noise certification supplemented with some procedural refinements contained in ICAO Working Group II recommendations for incorporation into the standard. The helicopters analyzed in this report include the Hughes 500 D/E, the Aerospatiale AS 350D (AStar), the Aerospatiale AS 355F (TwinStar), the Aerospatiale SA 365 (Dauphin), the Bell 222 Twin Jet, the Boeing Vertol 234/CH 47-D, and the Sikorsky S-76. The document discusses the evolution of international helicopter noise certification procedures and describes in detail the data acquisition, reduction and adjustment procedures. Noise levels are plotted versus the logarithm of maximum gross takeoff weight and are shown relative to the ICAO noise level limits. Data from the ICAO Committee on Aircraft Noise (CAN) Seventh meeting "request for data" are also presented. Reference testing and operational data are provided for each helicopter.			
17. Key Words helicopter, noise, heliport environmental impact, ICAO noise certification standards, aircraft noise, heliport, ICAO Annex 16		18. Distribution Statement This document is available to the public through the National Technical Information Service, Springfield, VA 22161	
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Technical Report Documentation Page

1. Report No. FAA-EE-86-04	2. Government Accession No. ADA 174 129	3. Recipient's Catalog No.	
4. Title and Subtitle Noise Levels From Urban Helicopter Operations, New Orleans, Louisiana		5. Report Date June 1986	
		6. Performing Organization Code	
		8. Performing Organization Report No.	
7. Author(s) Steven R. Albersheim		10. Work Unit No. (TRAIS)	
9. Performing Organization Name and Address Federal Aviation Administration Office of Environment and Energy 800 Independence Ave., SW Washington, DC 20591		11. Contract or Grant No.	
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12. Sponsoring Agency Name and Address		14. Sponsoring Agency Code	
15. Supplementary Notes			
16. Abstract  The FAA conducted a noise monitoring program of helicopter operations at the Lakefront Airport in New Orleans, Louisiana. The purpose was to obtain noise measurements from helicopter operations in an urban environment. During this monitoring program the FAA concentrated solely on helicopter approaches to Lakefront Airport. The noise data collected and classified as survey type data, since the monitoring program's measurements data obtained were from "target of opportunity" as opposed to a "controlled test" when the helicopter follow predefined flight path profiles. During the testing period, there were ten different helicopter models. Because of the high frequency of operations an opportunity was provided to determine the consistency between ALM values for the same helicopter model for different events. Since some of the monitoring sites were located in a residential community, an opportunity was provided to gather information on noise levels associated with a high frequency of helicopter operations.			
17. Key Words  Helicopter, Imax, Leq Environmental Noise Impact		18. Distribution Statement  This document is available to the public through the National Technical Information Service, Springfield, VA 22161	
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1. Report No. DOT/FAA/CT-TN86/11	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle FLUID ICE PROTECTION SYSTEMS		5. Report Date July 1986	
		6. Performing Organization Code ACT-340	
7. Author(s) Larry Hackler and Ralph Rissmiller, Jr.		8. Performing Organization Report No. DOT/FAA/CT-TN86/11	
9. Performing Organization Name and Address Federal Aviation Administration Technical Center Atlantic City Airport, New Jersey 08405		10. Work Unit No. (TRAIS)	
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16. Abstract Fluid ice protection systems are being installed on several new generation aircraft. There are many new considerations that must be taken into account when fluid ice protection systems are used. This Technical Note addresses the fluid ice protection system from the perspective of certification and presents a compendium of information for use by Federal Aviation Administration (FAA) certification engineers, Aircraft Certification Offices (ACO's) and others.			
17. Key Words Aircraft Icing Freezing Point Depressant Fluid Glycol Anti-Ice Deice		18. Distribution Statement Document is on file at the Technical Center Library, Atlantic City Airport, New Jersey 08405	
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## Technical Report Documentation Page

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4. Title and Subtitle  Aeronautical Decision-Making For Student And Private Pilots		5. Report Date May 1987	
		6. Performing Organization Code	
7. Author s. Alan E. Diehl, Peter V. Hwoschinsky, Gary S. Livack, Russell S. Lawton, Editors		8. Performing Organization Report No.	
9. Performing Organization Name and Address Systems Control Technology, Inc. 1611 North Kent Street, Suite 905 Arlington, VA 22209		10. Work Unit No. (TRAIS)	
		11. Contract or Grant No. DTFA01-80-C-10080	
12. Sponsoring Agency Name and Address U.S. Department of Transportation Federal Aviation Administration 800 Independence Avenue, S. W. Washington, DC 20591		13. Type of Report and Period Covered  Final Report	
		14. Sponsoring Agency Code AAM-500 APM-450	
15. Supplementary Notes AAM-500 Biomedical and Behavioral Sciences Division APM-450 Navigation and Landing Division, Helicopter Program Branch			
16. Abstract  <p>Aviation accident data indicate that the majority of aircraft mishaps are due to judgment error. This training manual is part of a project to develop materials and techniques to help improve pilot decision making. Training programs using prototype versions of these materials have demonstrated substantial reductions in pilot error rates. The results of such tests were statistically significant and ranged from approximately 10% to 50% fewer mistakes.</p> <p>This manual is designed to explain the risks associated with Student and Private pilot flying activities, the underlying behavioral causes to typical accidents, and the effects of stress on pilot decision making. It provides a means for the individual pilot to develop an "Attitude Profile" through a self-assessment inventory and provides detailed explanations of preflight and in-flight stress management techniques. The assumption is that pilots receiving this training will develop a positive attitude toward safety and the ability to manage stress effectively while recognizing and avoiding unnecessary risk.</p> <p>This manual is one of a series on Aeronautical Decision-Making prepared for the following pilot audiences: (1) Student and Private (2) Commercial (3) Instrument (4) Instructor (5) Helicopter (6) Multi-Crew.</p>			
17. Key Words Human Factors Human Performance Aviation Safety Aviation Training Pilot Error		18. Distribution Statement This document is available to the U.S. public through the National Technical Information Service, Springfield, Virginia 22161.	
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4. Title and Subtitle Aeronautical Decision Making For Commercial Pilots				5. Report Date July 1988	
				6. Performing Organization Code	
7. Author(s) R. S. Jensen and J. Adriani				8. Performing Organization Report No.	
9. Performing Organization Name and Address Systems Control Technology, Inc. 1611 North Kent Street, Suite 910 Arlington, Virginia 22209				10. Work Unit No. (TRAIS)	
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12. Sponsoring Agency Name and Address U.S. Department of Transportation Federal Aviation Administration 800 Independence Avenue, S.W. Washington, D.C. 20591				13. Type Report and Period Covered Final Report	
				14. Sponsoring Agency Code AAM-500, ADS-220	
15. Supplementary Notes AAM-500 Biomedical and Behavioral Sciences Division ADS-220 Rotorcraft Technology Branch					
16. Abstract <p>Aviation accident data indicate that the majority of aircraft mishaps are due to judgement error. This training manual is part of a project to develop materials and techniques to help improve pilot decision making. Training programs using prototype versions of these materials have demonstrated substantial reductions in pilot error rates. The result of such tests were statistically significant and ranged from approximately 10% to 50% fewer mistakes.</p> <p>This manual is designed to explain the risks associated with commercial flying activities, the underlying behavioral causes of typical accidents, and the effects of stress on pilot decision making. It provides a means for the individual pilot to develop an "Attitude Profile" through a self-assessment inventory and provides detailed explanations of pre-flight and in-flight stress management techniques. The assumption is that pilots receiving this training will develop a positive attitude toward safety and the ability to effectively manage stress while recognizing and avoiding unnecessary risk.</p> <p>This manual is one of a series on Aeronautical Decision Making prepared for the following pilot audiences: (1) Student and Private (2) Commercial (3) Instrument (4) Instructor (5) Helicopter (6) Multi-Crew</p>					
17. Key Words Human Factor      Judgement Human Performance      Decision Making Aviation Safety      Commercial Pilots Aviation Training      Professional Pilots Pilot Error				18. Distribution Statement  This document is available to the U.S. public through the National Technical Information Service, Springfield, Virginia 22161.	
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1. Report No. DOT/FAA/PM-86/43		2. Government Accession No. ADA 186 112		3. Recipient's Catalog No.	
4. Title and Subtitle Aeronautical Decision Making for Instrument Pilots				5. Report Date May 1987	
				6. Performing Organization Code	
				8. Performing Organization Report No.	
7. Author(s) Richard S. Jensen, Janeen Adrion, Russell S. Lawton					
9. Performing Organization Name and Address Systems Control Technology, Inc. 1611 North Kent Street, Suite 905 Arlington, VA 22209				10. Work Unit No. (TRAIS)	
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12. Sponsoring Agency Name and Address U.S. Department of Transportation Federal Aviation Administration 800 Independence Avenue, S.W. Washington, DC 20591				14. Sponsoring Agency Code AAM-500 APM-450	
15. Supplementary Notes AAM-500 Biomedical and Behavioral Sciences Division APM-450 Navigation and Landing Division, Helicopter Program Branch					
16. Abstract  Aviation accident data indicate that the majority of aircraft mishaps are due to judgment error. This training manual is part of a project to develop materials and techniques to help improve pilot decision making. Training programs using prototype versions of these materials have demonstrated substantial reductions in pilot error rates. The results of such tests were statistically significant and ranged from approximately 10% to 50% fewer mistakes.  This manual is designed to explain the risks associated with instrument flying activities, the underlying behavioral causes of typical accidents, and the effects of stress on pilot decision making. It provides a means for the individual pilot to develop an "Attitude Profile" through a self-assessment inventory and provides detailed explanations of preflight and in-flight stress management techniques. The assumption is that pilots receiving this training will develop a positive attitude toward safety and the ability to effectively manage stress while recognizing and avoiding unnecessary risk.  This manual is one of a series on Aeronautical Decision Making prepared for the following pilot audiences: (1) Student and Private (2) Commercial (3) Instrument (4) Instructor (5) Helicopter (6) Multi-Crew.					
17. Key Words Human Factors                      Judgment Human Performance              Decision Making Aviation Safety                   Instrument Pilots Aviation Training                Professional Pilots Pilot Error				18. Distribution Statement  This document is available to the U.S. public through the National Technical Information Service, Springfield, Virginia 22161	
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7. Author(s) Georgette D. Euch, Russell S. Lawton, Gary S. Livack, Editors				8. Performing Organization Report No.	
9. Performing Organization Name and Address Systems Control Technology, Inc. 1611 North Kent Street, Suite 905 Arlington, VA 22209				10. Work Unit No. (TRAIS)	
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12. Sponsoring Agency Name and Address U.S. Department of Transportation Federal Aviation Administration 800 Independence Avenue, S.W. Washington, D.C. 20591				13. Type of Report and Period Covered  Final Report	
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15. Supplementary Notes AAM-500 Biomedical and Behavioral Sciences Division APM-450 Navigation and Landing Division, Helicopter Program Branch					
16. Abstract <p>Aviation accident data indicate that the majority of aircraft mishaps are due to judgment error. This training manual is part of a project to develop materials and techniques to help improve pilot decision making. Training programs using prototype versions of these materials have demonstrated substantial reductions in pilot error rates. The results of such tests were statistically significant and ranged from approximately 10% to 50% fewer mistakes.</p> <p>This manual is designed to explain the risks associated with flight instruction activities, the underlying behavioral causes of typical accidents, and the effects of stress on pilot decision making. This instructor manual explains the unique aspects of teaching judgment concepts in contrast with the imparting of knowledge and the development of airmanship skills in conventional flight training. It also provides detailed explanations of pre-flight and in-flight stress management techniques. The assumption is that CFI's receiving this training will develop a positive attitude toward safety and the ability to effectively manage stress while recognizing and avoiding unnecessary risk.</p> <p>This manual is one of a series on Aeronautical Decision Making prepared for the following pilot audiences: (1) Student and Private (2) Commercial (3) Instrument (4) Instructor (5) Helicopter (6) Multi-Crew.</p>					
17. Key Words Human Factors      Judgment Human Performance      Decision Making Aviation Safety      Instructor Pilots Aviation Training      Flight Instructor Pilot Error      Flight Instruction				18. Distribution Statement This document is available to the U.S. public through the National Technical Information Service, Springfield, Virginia 22161.	
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4. Title and Subtitle Aeronautical Decision Making - Cockpit Resource Management				5. Report Date January 1989							
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7. Author (s) Richard S. Jensen				8. Performing Organization Report No.							
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15. Supplementary Notes AAM-500 Biomedical and Behavioral Sciences Division ADS - 220 Rotorcraft Technology Branch, System Technology Division											
16. Abstract  <p>Aviation accident data indicate that the majority of aircraft mishaps are due to judgment error. This training manual is part of a project to develop materials and techniques to help improve pilot decision making. Training programs using prototype versions of these materials have demonstrated substantial reductions in pilot error rates. The results of such tests were statistically significant and ranged from approximately 10% to 50% fewer mistakes.</p> <p>This manual is designed to explain the risks associated with flying activities involving multi-crew aircraft, the underlying behavioral causes of typical accidents, and the effects of stress on pilot decision making. The objective of this material is to enhance interpersonal communication and to facilitate effective leadership and coordination between crewmembers. It provides a sophisticated approach to developing concerted action based on optimal decision making. Several Cockpit Resources Management (CRM) principles are presented in the manual; included are delegation of responsibilities, prioritization, vigilance and monitoring, joint discussion and planning, and receptive leadership techniques.</p> <p>This manual is one of a series on Aeronautical Decision Making (ADM) prepared for the following pilot audiences:</p> <table border="0"> <tr> <td>(1) Student and Private</td> <td>(4) Instrument</td> </tr> <tr> <td>(2) Instructor</td> <td>(5) Helicopter</td> </tr> <tr> <td>(3) Instrument</td> <td>(6) Multi-crew.</td> </tr> </table>						(1) Student and Private	(4) Instrument	(2) Instructor	(5) Helicopter	(3) Instrument	(6) Multi-crew.
(1) Student and Private	(4) Instrument										
(2) Instructor	(5) Helicopter										
(3) Instrument	(6) Multi-crew.										
17. Key Words Aviation Training Pilot Error Judgment Cockpit Resource Mgmt		Crew Coordination Human Factors Human Performance Aviation Safety Decision Making Communication		18. Distribution Statement  This document is available to the U.S. public through the National Technical Information Service, Springfield, Virginia 22161.							
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1. Report No. FAA-EE-87-2	2. Government Accession No. ADA 188 540	3. Recipient's Catalog No.	
4. Title and Subtitle International Civil Aviation Organization Committee on Aviation Environmental Protection Helicopter Noise Measurement Repeatability Program Final Report		5. Report Date September 1987	6. Performing Organization Code
7. Author(s) J. Steven Newman and Maryalice Locke (1)		8. Performing Organization Report No.	
9. Performing Organization Name and Address Federal Aviation Administration Office of Environment and Energy, Noise Abatement Div., Noise Technology Branch, (AEE-120), 800 Independence Avenue, SW, Washington, DC 20591		10. Work Unit No. (TRAIS)	11. Contract or Grant No.
12. Sponsoring Agency Name and Address Federal Aviation Administration Office of Environment and Energy, Noise Abatement Div., Noise Technology Branch, (AEE-120), 800 Independence Avenue, SW, Washington, DC 20591		13. Type of Report and Period Covered	
15. Supplementary Notes (1) UNISYS-SDC, 5151 Camino Ruiz, Camarillo, California 93010		14. Sponsoring Agency Code	
16. Abstract <p>This report summarizes the findings of the Helicopter Noise Measurement Repeatability Program (HNMRP), which was initiated by the International Civil Aviation Organization (ICAO) Committee on Aviation Environmental Protection (CAEP) Working Group II (WG II). The HNMRP was begun with the goal of further developing and refining international helicopter noise certification standards. This international effort has involved the active participation of Australia, Canada, the Federal Republic of Germany, France, Italy, Japan, the United Kingdom, and the United States.</p> <p>The participating ICAO CAEP WG II nations set out to investigate the degree of variability in test results of the existent helicopter noise certification rule by conducting a multinational noise measurement flight test program using a single, widely available helicopter, the Bell 206L-1 (or the acoustically equivalent 206L-3).</p> <p>The HNMRP has provided a large number of certificating authorities and industry participants the opportunity to acquire experience in helicopter noise certification and the opportunity to thoroughly test and review the requirements of Chapter 4 and Appendix 4 of ICAO Annex 16 through implementation experience. As a result of this experience, recommendations for improvements and refinements to Annex 16 were developed, and subsequently adopted as proposed amendments at the CAEP/1 meeting in Montreal in June 1986. The HNMRP also provided ICAO WG II the chance to review the inherent repeatability of noise levels for a single helicopter model tested by different teams at different locations.</p> <p>This report contains: a history of the HNMRP, a summary of the multi-nation comparison data, and discussion of the results of the program, including the refinements proposed for the international helicopter noise certification standard. Future analytical opportunities using HNMRP data are also discussed at the end of the report.</p>			
17. Key Words ICAO, helicopter, noise, Bell 206L-1, noise repeatability, noise certification, noise measurement, flight test, EPNL, SEL, international noise standards, PNLTm, ALm, variation in noise data		18. Distribution Statement This document is available to the public through the National Technical Information Service, Springfield, VA 22161, USA	
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1. Report No. DOT/FAA/CT-87/37	2. Government Accession No. ADA 199 162	3. Recipient's Catalog No.	
4. Title and Subtitle De-Icing of Aircraft Turbine Engine Inlets		5. Report Date June 1988	
		6. Performing Organization Code	
7. Author(s) H. Rosenthal, D. Nelepovitz, H. Rockholt		8. Performing Organization Report No.	
9. Performing Organization Name and Address Rohr Industries, inc. P.O. Box 0878 Chula Vista, California 92012-0878		10. Work Unit No. (TRAIS)	
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15. Supplementary Notes Flight Safety Research Branch, ACT-340 Gary Frings, Project Manager/Contracting Officer's Technical Representative			
16. Abstract  This document presents the results of an FAA investigation to determine the effects of using de-icing, as opposed to anti-icing, in aircraft turbine engine inlets. A literature search was conducted. Ice protection equipment technology was assessed.  This report describes the icing/de-icing process, discusses de-ice system operation and performance and ice detector characteristics, and presents a method for determining the effects of the de-icing process on the turbine engine and its associated induction system.			
17. Key Words  Aircraft Icing De-Icing Systems Ice Detectors Anti-Icing		18. Distribution Statement  Document is available to the U.S. public through the National Technical Information Service, Springfield, Virginia 22161	
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1. Report No. DOT/FAA/CT-TN87/40, II	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle HELIPORT VISUAL APPROACH AND DEPARTURE AIRSPACE TESTS, VOLUME III APPENDIXES		5. Report Date July 1989	6. Performing Organization Code ACD-330
7. Author(s) Rosanne M. Weiss, Christopher J. Wolf, Maureen Harris, and James Triantos		8. Performing Organization Report No. DOT/FAA/CT-TN87/40, II	
9. Performing Organization Name and Address Department of Transportation Federal Aviation Administration Technical Center Atlantic City International Airport, NJ 08405		10. Work Unit No. (TRAIS)	11. Contract or Grant No. T0701R
12. Sponsoring Agency Name and Address Department of Transportation Federal Aviation Administration Rotorcraft Technology Branch, ADS-220 Washington, DC 20591		13. Type of Report and Period Covered Technical Note March - July 1987	
15. Supplementary Notes		14. Sponsoring Agency Code ADS-220, AAS-100	
16. Abstract <p>During the winter and spring of 1987 flight tests were conducted at the Federal Aviation Administration (FAA) Technical Center's Concepts Development and Demonstration Heliport at the Atlantic City International Airport, NJ. The purpose of these flights was to examine and validate the current heliport approach/ departure surfaces criteria as defined in the Heliport Design Guide and to recommend modifications to these surfaces, if appropriate. The flight activities were conducted using aircraft representative of those in the civilian world. Data were collected using approach surfaces of 7.125°, 8.00°, 10.00°, and 12.00° for straight as well as curved path procedures. Also, departure surfaces of 7.125°, 10.00°, and 12.00° for straight and curved path procedures were used. All maneuvers were tracked by ground based tracking systems.</p> <p>Volume I of this report documents the results of this activity. It describes the flight test and evaluation methodology and addresses technical as well as operational issues. It provides statistical and graphical analysis of pilot performance along with a discussion of pilot subjective opinions concerning the acceptability and perceived workload, safety, and control margins associated with the performance flown. This volume contains the briefing packets, pilot questionnaires, flight logs, and data plots.</p> <p>The results of this work will be considered in the future modifications of the FAA Heliport Design Advisory Circular, AC 150/5390-2.</p>			
17. Key Words Heliport Approach Surface Departure Profile Heliport Design		18. Distribution Statement Document is on file at the Technical Center Library, Atlantic City Airport New Jersey 08405	
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4. Title and Subtitle ANALYSIS OF HELIPORT ENVIRONMENTAL DATA: INDIANAPOLIS DOWNTOWN HELIPORT, WALL STREET HELIPORT, VOLUME I SUMMARY		5. Report Date October 1988	6. Performing Organization Code ACD-330
		8. Performing Organization Report No. DOT/FAA/CT-TN87/54, I	
7. Author(s) Rosanne M. Weiss, John G. Morrow, Donald Gallagher, Mark DiMeo, and Scott Erlichman		10. Work Unit No. (TRAIS)	
9. Performing Organization Name and Address Department of Transportation Federal Aviation Administration Technical Center Atlantic City International Airport, NJ 08405		11. Contract or Grant No. T0701R	
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12. Sponsoring Agency Name and Address Department of Transportation Federal Aviation Administration Rotorcraft Technology, ADS-220 Washington, DC 20590		14. Sponsoring Agency Code ADS-220 and AAS-100	
15. Supplementary Notes			
16. Abstract  <p>During the summer of 1987 heliport environmental data were collected at the Indianapolis Downtown Heliport and at New York's Wall Street Heliport. The purpose of this data collection activity was to obtain measures of rotorwash in the heliport environment due to maneuvering helicopters, and to obtain pilot perceptions and observations concerning maneuvering and parking separation criteria. Ten wind vector transmitters were situated at various locations around the heliport in order to gather information to describe the rotorwash induced wind speed and direction changes. Pilot interviews were also conducted at these heliports.</p> <p>Volume I of this report documents the results of this activity. It describes the data collection and analysis methodology and addresses technical as well as operational issues. It provides graphical descriptions of the heliport environment and of wind speed changes due to rotorwash from maneuvering helicopters, along with analysis of pilot responses.</p> <p>Volumes II and III provide the plots generated from the New York and Indianapolis Heliport data.</p> <p>The results of this study will be considered in future modifications of the Federal Aviation Administration (FAA) Heliport Design Advisory Circular (AC) 150/5390-2.</p>			
17. Key Words Heliport Rotorcraft Rotorwash heliport Design Advisory Circular		18. Distribution Statement This document is available to the U.S. public through the National Technical Information Service, Springfield, Virginia 22161.	
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4. Title and Subtitle ANALYSIS OF HELIPORT ENVIRONMENTAL DATA: INDIANAPOLIS DOWNTOWN HELIPORT, WALL STREET HELIPORT, VOLUME II WALL STREET HELIPORT DATA PLOTS		5. Report Date May 1989	
		6. Performing Organization Code ACD-330	
7. Author(s) Rosanne M. Weiss, John G. Morrow, Donald Gallagher, Mark DiMeo, and Scott Erlichman		8. Performing Organization Report No. DOT/FAA/CT-TN87/54, II	
9. Performing Organization Name and Address Department of Transportation Federal Aviation Administration Technical Center Atlantic City International Airport, N.J. 08405		10. Work Unit No. (TRAIS)	
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12. Sponsoring Agency Name and Address Department of Transportation Federal Aviation Administration Rotorcraft Technology Office Washington, D.C. 20590		13. Type of Report and Period Covered  Technical Note May 1988	
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16. Abstract  During the summer of 1987 heliport environmental data were collected at Indianapolis Downtown Heliport and at New York's Wall Street Heliport. The purpose of this data collection activity was to obtain measures of rotorwash in the heliport environment due to maneuvering helicopters, and to obtain pilot perceptions and observations concerning maneuvering and parking separation criteria. Ten wind vector transmitters were situated at various locations around the heliport in order to gather information to describe the rotorwash induced wind speed and direction changes. Pilot interviews were also conducted at these heliports.  Volume I of this report provides a summary of the results of this activity. Volume III provides the plots generated from the wind sensor data collected at the Indianapolis Downtown Heliport.  This volume (Volume II) provides the plots generated from the wind sensor data collected at New York's Wall Street Heliport.  The results of this study will be considered in future modifications of the Federal Aviation Administration (FAA) Heliport Design Advisory Circular, AC 150/5390-2.			
17. Key Words Rotor Downwash Wind Speed Heliport		18. Distribution Statement This document is available to the U. S. public through the National Technical Information Service, Springfield, Virginia 22161.	
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1. Report No. DOT/FAA/CT-TN87/54, III	2. Government Accession No. ADA 217 412	3. Recipient's Catalog No.	
4. Title and Subtitle ANALYSIS OF HELIPORT ENVIRONMENTAL DATA: INDIANAPOLIS DOWNTOWN HELIPORT, WALL STREET HELIPORT, VOLUME III INDIANAPOLIS DOWNTOWN HELIPORT DATA PLOTS		5. Report Date October 1989	
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7. Author(s) Rosanne M. Weiss, John G. Morrow, Donald Gallagher, Mark DiMeo, and Scott Erlichman		8. Performing Organization Report No. DOT/FAA/CT-TN87/54, III	
9. Performing Organization Name and Address Department of Transportation Federal Aviation Administration Technical Center Atlantic City International Airport, N.J. 08405		10. Work Unit No. (TRAIS)	
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12. Sponsoring Agency Name and Address Department of Transportation Federal Aviation Administration Maintenance and Development Service Washington, D.C. 20591		13. Type of Report and Period Covered Technical Note	
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15. Supplementary Notes			
<p>16. Abstract</p> <p>During the summer of 1987 heliport environmental data were collected at the Indianapolis Downtown Heliport and at New York's Wall Street Heliport. The purpose of this data collection activity was to obtain measures of rotorwash in the heliport environment due to maneuvering helicopters, and to obtain pilot perceptions and observations concerning maneuvering and parking separation criteria. Ten wind vector transmitters were situated at various locations around the heliport in order to gather information to describe the rotorwash induced wind speed and direction changes. Pilot interviews were also conducted at these heliports.</p> <p>Volume I of this report provides a summary of the results of this activity. Volume II provides the plots generated from the wind sensor data collected at New York's Wall Street Heliport.</p> <p>This volume (Volume III) provides the plots generated from the wind sensor data collected at the Indianapolis Downtown Heliport.</p> <p>The results of this study will be considered in future modifications of the Federal Aviation Administration (FAA) Heliport Design Advisory Circular, AC150/5390-2.</p>			
17. Key Words Rotor Downwash Wind Speed Heliport		18. Distribution Statement This document is available to the U.S. public through the National Technical Information Service, Springfield, Virginia 22161.	
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11. TITLE (Include Security Classification) Report of Investigative Testing of Global Positioning System Slant Range Accuracy			
12. PERSONAL AUTHOR(S) Captain Jeryl S. Cornell			
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17. COSATI CODES		18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)	
FIELD	GROUP	SUB-GROUP	
19. ABSTRACT (Continue on reverse if necessary and identify by block number) This report describes the results of an investigative flight test evaluating the slant range accuracy of Global Positioning System (GPS) user equipment. The report describes flight test facilities, equipment and methodology, and addresses data collection and reduction procedures.  It was concluded that the two-channel, Precision Code GPS receiver provides the ranging accuracy required to support Microwave Landing System (MLS) approaches down to International Civil Aviation Organization (ICAO) Category II minimums of 100 foot ceiling and 1/4-mile visibility. GPS consistently demonstrated range errors less than $\pm 100$ feet. GPS ranging accuracy measurements were taken only during periods where four or more GPS satellites were visible.			
20. DISTRIBUTION/AVAILABILITY OF ABSTRACT <input checked="" type="checkbox"/> UNCLASSIFIED/UNLIMITED <input type="checkbox"/> SAME AS RPT <input type="checkbox"/> OTC USERS		21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED	
22a. NAME OF RESPONSIBLE INDIVIDUAL Captain Jeryl S. Cornell		22b. TELEPHONE (Include Area Code)   22c. OFFICE SYMBOL 201-544-4873   SAVAA-1	

# Technical Report Documentation Page

1. Report No. DOT/FAA/EE-88-2	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle Heliport Noise Model (HNM) Version 1 User's Guide		5. Report Date February 1988	
		6. Performing Organization Code	
		8. Performing Organization Report No.	
7. Author(s) D. Keast, K. Eldred, J. Purdum		10. Work Unit No. (TRAIS)	
9. Performing Organization Name and Address HMM Associates, Inc. 336 Baker Avenue Concord, MA 01741		11. Contract or Grant No. DTFA01-85-C-00068	
		13. Type of Report and Period Covered User's Guide	
12. Sponsoring Agency Name and Address Federal Aviation Administration AEE-120 800 Independence Avenue, SW Washington, DC 20591		14. Sponsoring Agency Code	
15. Supplementary Notes			
16. Abstract  This document contains the instructions to execute the Heliport Noise Model (HNM', Version 1. HNM Version 1 is a computer tool for determining the total impact of helicopter noise at and around heliports. The model runs on IBM PC/XT/AT personal computers and compatibles. This manual contains a general description of elements of a heliport case study and specific instructions for preparing the case for input.  HNM Version 1 is based upon the FAA's Integrated Noise Model (INM) for noise from fixed-wing aircraft.			
17. Key Words Helicopters Heliport Noise Computer Model Airport Noise		18. Distribution Statement This document is available to the public through the National Technical Information Service, Springfield, VA 22161	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 210	22. Price

1. Report No. DOT/FAA/CT-TN88/5	2. Government Accession No. ADA 200 027	3. Recipient's Catalog No.	
4. Title and Subtitle HELIPORT VISUAL APPROACH SURFACE HIGH TEMPERATURE AND HIGH ALTITUDE TEST PLAN		5. Report Date June 1988	6. Performing Organization Code ACT-140
		8. Performing Organization Report No. DOT/FAA/CT-TN88/5	
		10. Work Unit No. (TRAIS)	17. Contract or Grant No. T0701R
7. Author(s) Marvin S. Plotka and Rosanne M. Weiss		13. Type of Report and Period Covered Technical Note October-December 1987	
9. Performing Organization Name and Address U.S. Department of Transportation Federal Aviation Administration Technical Center Atlantic City International Airport, N.J. 08405		14. Sponsoring Agency Code	
12. Sponsoring Agency Name and Address U.S. Department of Transportation Federal Aviation Administration Rotorcraft Technology, ADS-220 Washington, D.C. 20590			
15. Supplementary Notes			
16. Abstract  This Technical Note identifies procedures to be used during tests to be conducted at the Albuquerque International Airport (ABQ), Albuquerque, New Mexico. These tests are designed to evaluate the applicability of existing heliport approach and departure surface criteria under high temperature and high altitude conditions. A UH-1H aircraft will be used. This project is similar to the work documented in DOT/FAA/CT-TN87/40, "Heliport Visual Approach and Departure Airspace Tests".			
17. Key Words VMC Approach Surfaces, Heliport Helicopter, Clear Surfaces High Density Altitude High Altitude		18. Distribution Statement This document is available to the U.S. public through the National Technical Information Service, Springfield, Va. 22161	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this paper) Unclassified	21. No. of Pages 28	22. Price

1. Report No. DOT/FAA/DS-88/7	2. Government Accession No. ADA 212 662	3. Recipient's Catalog No.	
4. Title and Subtitle Risk Management for Air Ambulance Helicopter Operators		5. Report Date January 1989	
		6. Performing Organization Code	
7. Author (s) R. J. Adams, J.L. Thompson		8. Performing Organization Report No.	
9. Performing Organization Name and Address Systems Control Technology, Inc. 1611 North Kent Street, Suite 910 Arlington, Virginia 22209		10. Work Unit No. (TRAIS)	
		11. Contract or Grant No. DTFA01-87-C-0014, W.O. 5A	
12. Sponsoring Agency Name and Address U.S. Department of Transportation Federal Aviation Administration 800 Independence Avenue, S.W. Washington, D.C. 20591		13. Type Report and Period Covered Technical Report	
		14. Sponsoring Agency Code ADS-220	
15. Supplementary Notes AAM - 500 Biomedical and Behavioral Sciences Division ADS - 220 Rotorcraft Technology Branch, System Technology Division			
16. Abstract <p>This manual is intended to provide an easy reference for dealing with the operating pitfalls, the human frailties, and the risks in managing an air ambulance operation. It is not designed to give the operator step-by-step instructions. Rather, the manual describes techniques and tools that can be used to balance the demands of running a business with the need for maintaining safety. It provides pilot selection and training guidelines, as well as a review of a risk assessment technique that have proven successful for Part 135 operators. In addition, the manual recommends a workable format for establishing standard operating procedures to reduce risks. Finally, it highlights the key concerns that should be carefully considered from a risk management viewpoint.</p> <p>This operators manual is one of an integrated set of five Aeronautical Decision Making (ADM) manuals developed by the Federal Aviation Administration in a concerted effort to reduce the number of human factor related helicopter accidents. It can be used as one element of a comprehensive program for improving safety, reducing risk and, hopefully, the high cost of helicopter hull and liability insurance. The other four documents of the set are:</p> <ol style="list-style-type: none"> <li>1. ADM for Helicopter Pilots (DOT/FAA/PM-86/45)</li> <li>2. ADM for EMS Helicopter Pilots -- Learning from Past Mistakes (DOT/FAA/DS-88/5)</li> <li>3. ADM for EMS Helicopter Pilots -- Situational Awareness Exercises (DOT/FAA/DS-88/6)</li> <li>4. ADM for Air Ambulance Hospital Administrators (DOT/FAA/DS-88/8)</li> </ol>			
17. Key Words Human Factors                      Judgment Human Performance              Decision Making Aviation Safety                    Helicopter Pilot Aviation Training                Helicopter Operator Air Ambulance                    Helicopter		18. Distribution Statement  This document is available to the U.S. public through the National Technical Information Service, Springfield, Virginia 22161	
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1. Report No. DOT/FAA/DS-88/8	2. Government Accession No. ADA 219 404	3. Recipient's Catalog No.							
4. Title and Subtitle Aeronautical Decisionmaking for Air Ambulance Program Administrators		5. Report Date February 1990							
		6. Performing Organization Code							
7. Author (s) R. J. Adams, E. D. McConkey		8. Performing Organization Report No. SCT 90RR-5							
9. Performing Organization Name and Address Systems Control Technology, Inc. 1611 North Kent Street, Suite 910 Arlington, Virginia 22209		10. Work Unit No. (TRAIS)							
		11. Contract or Grant No. DTFA01-87-C-00014, W.O. 5A							
12. Sponsoring Agency Name and Address U.S. Department of Transportation Federal Aviation Administration 800 Independence Avenue, S.W. Washington, D.C. 20591		13. Type Report and Period Covered Final Report							
		14. Sponsoring Agency Code ADS - 220, AAM-500							
15. Supplementary Notes AAM - 500 Biomedical and Behavioral Sciences Division ADS - 220 Rotorcraft Technology Branch, System Technology Division									
16. Abstract <p>This manual discusses five of the most critical administrative aeronautical decision areas. The treatment is brief to ensure that the important, basic aeronautical limits will be read and understood by the largest possible audience. The concerns are:</p> <table border="0"> <tr> <td>ACCIDENT CHARACTERISTICS</td> <td>TRAINING NEEDS</td> </tr> <tr> <td>PILOT CHARACTERISTICS</td> <td>RISK MANAGEMENT</td> </tr> <tr> <td>WEATHER RESTRICTIONS</td> <td></td> </tr> </table> <p>Each of these concerns is discussed in a summary format. The summaries begin with a concise statement of the problem. This statement is followed by a discussion of the governing regulations, an explanation of the underlying reasons for the limitation, and recommended solutions an administrator could implement to reduce the impact of, or eliminate, the risk. This summary material is supplemented by appropriate references for use by the reader who would like to explore one or more of these areas in greater detail.</p> <p>This administrators' manual is one of an integrated set of five Aeronautical Decisionmaking (ADM) manuals developed by the Federal Aviation Administration in a concerted effort to reduce the number of human factor related helicopter accidents. It can be used as one element of a comprehensive program for improving safety, reducing risk and, hopefully, the high cost of helicopter hull and liability insurance. The other four documents of the set are:</p> <ol style="list-style-type: none"> <li>1. ADM for Helicopter Pilots (DOT/FAA/PM-86/45)</li> <li>2. ADM for EMS Helicopter Pilots -- Learning from Past Mistakes (DOT/FAA/DS-88/5)</li> <li>3. ADM for EMS Helicopter Pilots -- Situational Awareness Exercises (DOT/FAA/DS-88/6)</li> <li>4. Risk Management for Air Ambulance Helicopter Operators (DOT/FAA/DA-88/7)</li> </ol>				ACCIDENT CHARACTERISTICS	TRAINING NEEDS	PILOT CHARACTERISTICS	RISK MANAGEMENT	WEATHER RESTRICTIONS	
ACCIDENT CHARACTERISTICS	TRAINING NEEDS								
PILOT CHARACTERISTICS	RISK MANAGEMENT								
WEATHER RESTRICTIONS									
17. Key Words Human Factors Human Performance Aviation Safety Aviation Training Air Ambulance		18. Distribution Statement <p>This document is available to the U.S. public through the National Technical Information Service, Springfield, Virginia 22161</p>							
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 24	22. Price						

1. Report No. DOT/FAA/CT-88/10	2. Government Accession No. ADA 211 451	3. Recipient's Catalog No.	
4. Title and Subtitle DIGITAL SYSTEMS VALIDATION HANDBOOK - VOLUME II		5. Report Date FEBRUARY 1989	
		6. Performing Organization Code CRMI	
		8. Performing Organization Report No. DOT/FAA/CT-88/10	
7. Author(s) SEE TABLE OF CONTENTS		10. Work Unit No. (TRAIS)	
9. Performing Organization Name and Address COMPUTER RESOURCE MANAGEMENT INCORPORATED 950 HERNDON PARKWAY SUITE 360 HERNDON, VA 22070		11. Contract or Grant No. DTFA03-86-C-00042	
		13. Type of Report and Period Covered F'NDBOOK	
12. Sponsoring Agency Name and Address U.S. DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION TECHNICAL CENTER ATLANTIC CITY INTERNATIONAL AIRPORT, NJ 08405		14. Sponsoring Agency Code ACD-230	
15. Supplementary Notes Point of Contact: Pete Saraceni, ACD-230 FAA Technical Center Atlantic City International Airport, NJ 08405			
16. Abstract Volume II covers detailed technical topics such as latent faults; data buses; integrated assurance assessment; analytical sensor redundancy; and protection against lightning, electromagnetic interference, and high energy radio frequency fields. These topics are covered in detail to familiarize the certification engineer with the issues involved in implementing the new technologies.  Volume II covers topics that will enable the certification engineer to understand the information presented in type certification and supplemental type certification documentation, to understand variations in the implementation of technologies, and to discuss them with the design engineer.  Volume II also addresses some of the soon-to-be-available technologies in the "Advanced Validation Issues" chapter. The direction of aviation research in the United States is discussed along with challenges and problems that confront the certification engineer in certifying the new technologies.  Since the topics discussed in this Handbook are at the forefront of technological research, some of the concepts presented are subject to discussion by experts in the field. In these areas, the Handbook presents various viewpoints alerting the certification engineer to the various views so that this information will be considered in formulating decisions and developing certification criteria.			
17. Key Words Avionics, Digital, Validation, Certification, Reliability, Redundancy, Latent Faults, Fault Insertion, Data Buses, Lightning, Radio Frequency Fields, Transients, Verification, Composites, Modeling		18. Distribution Statement This document is available to the U.S. public through the National Technical Information Service, Springfield, Virginia 22161	
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1. Report No. DOT/FAA/CT-TN88/19		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle TEST PLAN FOR HELICOPTER VISUAL SEGMENT APPROACH LIGHTING SYSTEM (HALS)				5. Report Date November 1988	
				6. Performing Organization Code ACD-330	
7. Author(s) Scott B. Shollenberger and Barry R. Billmann				8. Performing Organization Report No. DOT/FAA/CT-TN88/19	
9. Performing Organization Name and Address Department of Transportation Federal Aviation Administration Technical Center Atlantic City International Airport, N.J. 08405				10. Work Unit No. (TRAIS)	
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12. Sponsoring Agency Name and Address Department of Transportation Federal Aviation Administration Maintenance and Development Service Washington, D.C. 20590				13. Type of Report and Period Covered Technical Note	
				14. Sponsoring Agency Code	
15. Supplementary Notes Project is a joint effort between Helicopter Navigation, ACD-330, Flight Standards, AVN-212, and Airport Lighting, ACD-110.					
16. Abstract  This test plan describes a test designed to obtain subjective pilot data on the Helicopter Visual Segment Approach Lighting System (HALS). Results should identify the performance measures which will most closely correlate with the pilot's ability to visually acquire a HALS equipped heliport and identify if HALS qualifies for visibility credit.					
17. Key Words Approach Lighting System HALS MLS TERPS			18. Distribution Statement Document is on file at the Technical Center Library, Atlantic City International Airport, N.J. 08405		
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1. Report No. DOT/FAA/CT-TN88/30	2. Government Accession No. ADA 214 116	3. Recipient's Catalog No.	
4. Title and Subtitle  HELIPORT SURFACE MANEUVERING TEST RESULTS		5. Report Date June 1989	
		6. Performing Organization Code ACD-330	
7. Author(s) Rosanne M. Weiss, Christopher J. Wolf, Scott J. Erlichman, John G. Morrow, and Walter E. Dickerson		8. Performing Organization Report No. DOT/FAA/CT-TN88/30	
9. Performing Organization Name and Address Department of Transportation Federal Aviation Administration Technical Center Atlantic City International Airport, NJ 08405		10. Work Unit No. (TRAIL)	
		11. Contract or Grant No. DOT-OR	
12. Sponsoring Agency Name and Address Department of Transportation Federal Aviation Administration Rotorcraft Technology Office Washington, DC 20590		13. Type of Report and Period Covered Technical Note October 1987 - January 1988	
		14. Sponsoring Agency Code ADS-220 and AAS-100	
15. Supplementary Notes  ADS-220 Rotorcraft Technology AAS-100 Design and Operating Criteria Division			
16. Abstract  During late fall 1987 and early spring 1988 flight tests were conducted at the Federal Aviation Administration (FAA) Technical Center's National Concepts Development and Demonstration Heliport. The purpose of these tests was to measure pilot perception of helicopter tip clearances for parking and taxiing maneuvers and to measure pilot performance during these maneuvers.  Over 100 parking and taxiing maneuvers were conducted using a UH-1H helicopter. The parking procedures were conducted under head, tail, and crosswind conditions, both with and without an obstacle in place. The taxiing procedures were carried out with a centerline, with only side markings, and with no ground markings. A ground-based laser tracker system was used to track the taxiing procedures. Pilot subjective data in reference to these maneuvers were collected via a post-flight questionnaire.  Pilot interviews were conducted at heliports across the country. These interviews gathered pilot views concerning rotor tip clearances for parking and hover taxiing maneuvers, ground markings for parking operations, and hover taxiing heights.  This report documents the results of this activity. It describes the data collection and analysis methodology and addresses objective as well as subjective issues. It provides statistical and graphical analysis of pilot performance and perception data and pilot subjective data.			
17. Key Words Heliport Heliport Parking Heliport Taxiing Rotor Tip Clearances		18. Distribution Statements This document is available to the U. S. public through the National Technical Information Service, Springfield, Virginia 22161.	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 81	22. Price

1. Report No. DOT/FAA/CT-TN88/45	2. Government Accession No. ADA 208 401	3. Recipient's Catalog No.	
4. Title and Subtitle HELIPORT NIGHT PARKING AREA CRITERIA TEST PLAN		5. Report Date March 1989	
		6. Performing Organization Code ACD-330	
		8. Performing Organization Report No. DOT/FAA/CT-TN88/45	
7. Author(s) Marvin S. Plotka and Rosanne M. Weiss		10. Work Unit No. (TRAIS)	
9. Performing Organization Name and Address U.S. Department of Transportation Federal Aviation Administration Technical Center Atlantic City International Airport, N.J. 08405		11. Contract or Grant No. T0701R	
		13. Type of Report and Period Covered Technical Note January - April 1989	
12. Sponsoring Agency Name and Address U.S. Department of Transportation Federal Aviation Administration Rotorcraft Technology Washington, D.C. 25090		14. Sponsoring Agency Code ADS-220	
15. Supplementary Notes			
16. Abstract  <p>This flight test plan describes the methodology to examine the issue of heliport night parking surface separation criteria. Operational measures will be collected at the Federal Aviation Administration (FAA) Technical Center, Atlantic City International Airport, New Jersey, using an instrumented UH-1H helicopter.</p> <p>Flight maneuvers will be conducted at the Technical Center to identify night parking area separation criteria under various wind conditions. Wind velocity and direction data will be collected during night parking operations to determine effects at different locations around the parking area. This data will be used to create a baseline for characterizing heliport night parking area separation criteria. The test development, test equipment, data collection, data reduction, and analysis of flight data are discussed. A schedule for the completion of the associated tasks is presented.</p>			
17. Key Words VMC Night Parking Surfaces Surface Maneuver Parking Areas/Heliport Separation Criteria		18. Distribution Statement This document is available to the U.S. public through the National Technical Information Service, Springfield, 22161	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 14	22. Price

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4           An Investigation of Lateral Tracking Techniques, Flight Directors and Automatic Control Coupling on Decelerating IFR Approaches for Rotorcraft				
AUTHOR(S)/AUTEUR(S)				
5           S. Baillie, S. Kereliuk and R. Hoh				
SERIES/SÉRIE				
6           Aeronautical Note				
CORPORATE AUTHOR/PERFORMING AGENCY/AUTEUR D'ENTREPRISE/AGENCE D'EXÉCUTION				
7           National Research Council Canada National Aeronautical Establishment                   High Speed Aerodynamics Laboratory				
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8           National Research Council, National Aeronautical Establishment Federal Aviation Administration				
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9           88-10	10	11	12a           72	12b           42
NOTES				
13				
DESCRIPTORS (KEY WORDS)/MOTS-CLÉS				
14           1. Wind profiles 2. Velocity distribution				
SUMMARY/SOMMAIRE				
15           An in flight simulation experiment was performed to investigate the impact on handling qualities and certification of various issues associated with low minima decelerating flight directed IFR approaches for rotorcraft. These issues were the use of crab versus sideslip techniques to maintain lateral tracking under crosswind conditions, the effects of various methods of vertical axis (glideslope) display, guidance and control, and the benefits of coupling flight director signals directly to the rotorcraft control actuators. The program was performed at the Flight Research Laboratory of the National Aeronautical Establishment (NAE), using the NAE Bell 205 Airborne Simulator and was partially funded by the United States Federal Aviation Administration. Experimental results demonstrated that crab technique approaches were satisfactory for all approach speeds and wind conditions investigated (up to 30 knot crosswinds). A factor not addressed in this study was the visual orientation of the landing pad at breakout to flight with visual references. Sideslipping approaches were also shown to be satisfactory until the steady state lateral acceleration exceeded approximately 0.07 G. While coupling of the collective actuator directly to the flight director provided the best glideslope tracking, evaluations showed that the configuration with a 2-cue (pitch and roll) flight director, using only a raw glideslope presentation, provided satisfactory handling qualities and was considered by FAA and DOT representatives to be certifiable for IFR flight. Coupling of any single axis of control to the flight director was demonstrated to provide slight workload relief benefits and the collective axis was judged to be the most likely candidate axis for this implementation.				

1. Report No. DOT/FAA/DS-89/03	2. Government Accession No. ADA 207 162	3. Recipient's Catalog No.	
4. Title and Subtitle FAA Rotorcraft Research, Engineering and Development - Bibliography, 1962-1988		5. Report Date March 1989	
		6. Performing Organization Code ADS-220	
7. Author(s) Robert D. Smith		8. Performing Organization Report No.	
9. Performing Organization Name and Address Federal Aviation Administration Advanced System Design Service Rotorcraft Technology Branch, ADS-220 Washington, D.C. 20591		10. Work Unit No. (TRAIS)	
		11. Contract or Grant No.	
12. Sponsoring Agency Name and Address Federal Aviation Administration Advanced System Design Service Rotorcraft Technology Branch, ADS-220 Washington, D.C. 20591		13. Type of Report and Period Covered  Bibliography 1962-1988	
		14. Sponsoring Agency Code ADS-220	
15. Supplementary Notes			
16. Abstract <p>This is a bibliography of FAA rotorcraft reports published from 1962 to 1988. This report is a supplement to an earlier bibliography "FAA Helicopter/Heliport Research, Engineering, and Development - Bibliography, 1964-1986" (FAA/PM-86/47) (AD-A174697). Both bibliographies are limited to documents in which the research, engineering, and development elements of the FAA were involved as sponsors, participants, or authors.</p> <p>This bibliography contains abstracts on 53 technical reports. The indexes in this document address these 53 reports as well as the 133 reports in the earlier bibliography (FAA/PM-86/47).</p>			
17. Key Words Helicopter      Tiltrotor Heliport        Vertiport Rotorcraft      Powered-Lift Aircraft Bibliography		18. Distribution Statement  This document is available to the public through the National Technical Information Service, Springfield, Virginia 22161	
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# Technical Report Documentation Page

1. Report No. DOT/FAA/CT-89/5	2. Government Accession No. ADA 207 592	3. Recipient's Catalog No.	
4. Title and Subtitle STATISTICS ON AIRCRAFT GAS TURBINE ENGINE ROTOR FAILURES THAT OCCURRED IN U.S. COMMERCIAL AVIATION DURING 1983		5. Report Date March 1989	
		6. Performing Organization Code PE32	
7. Author(s) R. A. Delucia and J. T. Salvino		8. Performing Organization Report No. NAPC-PE-184	
9. Performing Organization Name and Address Commanding Officer Naval Air Propulsion Center PO Box 7176 Trenton, NJ 08628-0176		10. Work Unit No. (TRAIS)	
		11. Contract or Grant No. DOT/FA71NAAP98	
12. Sponsoring Agency Name and Address Department of Transportation Federal Aviation Administration Technical Center Atlantic City International Airport, NJ 08405		13. Type of Report and Period Covered Final Report	
		14. Sponsoring Agency Code ACD-210	
15. Supplementary Notes Project Manager: B. C. Fenton - Engine/Fuel Safety Branch FAA Technical Center			
16. Abstract <p>This report presents statistics relating to gas turbine engine rotor failures which occurred during 1983 in commercial aviation service use. One-hundred and seventy-two failures occurred in 1983. Rotor fragments were generated in 96 of the failures and, of these, 9 were uncontained. The predominant failures involved blade fragments, 95.4 percent of which were contained. Five disk failures occurred and four were uncontained. Fifty-nine percent of the 172 failures occurred during the takeoff and climb stages of flight.</p> <p>This service data analysis is prepared on a calendar year basis and published yearly. The data support flight safety analyses, proposed regulatory actions, certification standards, and cost benefit analyses.</p>			
17. Key Words Air Transportation Aircraft Hazards Aircraft Safety Gas Turbine Engine Rotor Failures Containment		18. Distribution Statement Document is available to the public through the National Technical Information Service, Springfield, Virginia 22161	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 25	22. Price

1. Report No. DOT/FAA/CT-89/6	2. Government Accession No. ADA 212 745	3. Recipient's Catalog No.	
4. Title and Subtitle STATISTICS ON AIRCRAFT GAS TURBINE ENGINE ROTOR FAILURES THAT OCCURRED IN U.S. COMMERCIAL AVIATION DURING 1984		5. Report Date June 1989	
		6. Performing Organization Code PE32	
		8. Performing Organization Report No. NAPC-PE-185	
7. Author(s) R. A. Delucia/J. T. Salvino, NAPC B. C. Fenton, FAA Technical Center		10. Work Unit No. (TRAIS)	
9. Performing Organization Name and Address Commanding Officer Naval Air Propulsion Center PO Box 7176 Trenton, NJ 08628-0176		11. Interagency Agreement DOD/FA71NA AP98	
		13. Type of Report and Period Covered Final Report	
12. Sponsoring Agency Name and Address Department of Transportation Federal Aviation Administration Technical Center Atlantic City International Airport, NJ 08405		14. Sponsoring Agency Code ACD-210	
15. Supplementary Notes			
16. Abstract  This report presents statistical information relating to gas turbine engine rotor failures which occurred during 1984 in commercial aviation service use. Two hundred and six failures occurred in 1984. Rotor fragments were generated in 114 of the failures and, of these, 18 were uncontained. The predominant failure involved blade fragments, 90.3 percent of which were contained. Seven disk failures occurred and all were uncontained. Seventy percent of the 206 failures occurred during the takeoff and climb stages of flight.  This service data analysis is prepared on a calendar year basis and published yearly. The data are useful in support of flight safety analyses, proposed regulatory actions, certification standards, and cost benefit analyses.			
17. Key Words Air Transportation Aircraft Hazards Aircraft Safety Gas Turbine Engine Rotor Failures Containment		18. Distribution Statement This document is available to the public through the National Technical Information Service, Springfield Virginia 22161	
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1. Report No. DOT/FAA/CT-89-7	2. Government Accession No. ADA 212 664	3. Recipient's Catalog No.	
4. Title and Subtitle  STATISTICS ON AIRCRAFT GAS TURBINE ENGINE ROTOR FAILURES THAT OCCURRED IN U.S. COMMERCIAL AVIATION DURING 1985		5. Report Date June 1989	6. Performing Organization Code PE32
		8. Performing Organization Report No. NAPC-PE-188	
		10. Work Unit No. (TRIS)	
7. Author(s) R. A. Delucia/J. T. Salvino, NAPC B. C. Fenton, FAA Technical Center		11. Interagency Agreement DOD/FA7INA AP98	
9. Performing Organization Name and Address Commanding Officer Naval Air Propulsion Center P.O. Box 7176 Trenton, NJ 08628-0176		13. Type of Report and Period Covered  Final Report	
12. Sponsoring Agency Name and Address Department of Transportation Federal Aviation Administration Technical Center Atlantic City International Airport, NJ 08405		14. Sponsoring Agency Code ACD-210	
15. Supplementary Notes			
16. Abstract  This report presents statistics relating to gas turbine engine rotor failures which occurred during 1985 in U. S. commercial aviation service use. Two hundred and seventy-three failures occurred in 1985. Rotor fragments were generated in 150 of the failures, and of these 14 were uncontained. The predominant failure involved blade fragments, 94.4 percent of which were contained. Six disk failures occurred and all were uncontained. Fifty-seven percent of the 273 failures occurred during the takeoff and climb stages of flight.  This service data analysis is prepared on a calendar year basis and published yearly. The data support flight safety analyses, proposed regulatory actions, certification standards, and cost benefit analyses.			
17. Key Words Air Transportation Aircraft Hazards Aircraft Safety Gas Turbine Engine Rotor Failures Containment		18. Distribution Statement This document is available to the public through the National Technical Information Service, Springfield, Virginia 22161	
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4. Title and Subtitle  HUMAN FACTORS ISSUES IN AIRCRAFT MAINTENANCE AND INSPECTION		5. Report Date October 1989	
		6. Performing Organization Code	
		8. Performing Organization Report No. 89-RR-18	
7. Author(s) William T. Shepherd, Ph.D., Editor James F. Parker, Jr., Ph.D., Co-Editor		10. Work Unit No. (TRAIS)	
9. Performing Organization Name and Address Systems Control Technology, Inc. 1611 North Kent Street, Suite 910 Arlington, Virginia 22209		11. Contract or Grant No. DTFA01-87-C-00014	
		13. Type of Report and Period Covered  Final Report	
12. Sponsoring Agency Name and Address U.S. Department of Transportation Federal Aviation Administration 800 Independence Avenue, S.W. Washington, D.C. 20591		14. Sponsoring Agency Code ADS-220, AAM-240	
15. Supplementary Notes AAM-240 Biomedical and Behavioral Sciences Branch ADS-220 Rotorcraft Technology Branch, System Technology Division			
16. Abstract  <p>The Federal Aviation Administration sponsored a two-day meeting in October 1988 to address issues of human factors and inspection. Presentations were given by some 13 individuals representing the full spectrum of interests in commercial aviation. Presentations also were given by three human factors scientists with backgrounds in vigilance and industrial inspection technology. Each presentation, as well as the following question and answer period, was recorded for transcription and study.</p> <p>The objective of the meeting was to identify human issues of importance, particularly as such issues might contribute to inspection or maintenance error. The desired outcome was to be:</p> <ul style="list-style-type: none"> <li>(1) an improved understanding of personnel performance in aviation maintenance, and</li> <li>(2) recommendations, as appropriate, to the FAA concerning needed research efforts and/or possible new or revised regulatory actions.</li> </ul> <p>Several recommendations were presented to the FAA in the areas of communications, training, management, regulatory review, and research and development.</p>			
17. Key Words  Human Factors Aircraft Maintenance Aircraft Inspection		18. Distribution Statement  This document is available to the U.S. public through the National Technical Information Service, Springfield, Virginia 22161.	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 120	22. Price

**Technical Report Documentation Page**

1. Report No. DOT/FAA/DS-89/9		2. Government Accession No. ADA 214 113		3. Recipient's Catalog No.	
4. Title and Subtitle <b>Rotorcraft Low Altitude CNS Benefit/Cost Analysis, Rotorcraft Operations Data</b>				5. Report Date September 1989	
				6. Performing Organization Code 5542-7A	
7. Author (s) Brian E. Mee, Deborah Peisen, Margaret B. Renton				8. Performing Organization Report No. SCT 89RR-47	
9. Performing Organization Name and Address Systems Control Technology, Inc. 1611 North Kent Street, Suite 910 Arlington, Virginia 22209				10. Work Unit No. (TRAIS)	
				11. Contract or Grant No. DTFA01-87-C-00014	
12. Sponsoring Agency Name and Address U.S. Department of Transportation Federal Aviation Administration 800 Independence Avenue, S.W. Washington, D.C. 20591				13. Type Report and Period Covered Interim Report	
				14. Sponsoring Agency Code ADS - 220	
15. Supplementary Notes ADS - 220 Rotorcraft Technology Branch, System Technology Division					
16. Abstract  <p>Communications, navigation, and surveillance (CNS) services are readily available at the altitudes flown by most fixed-wing aircraft. They are not, however, always available at the lower altitudes at which most rotary-wing aircraft operate. The objective of this study is to determine if there is an economic basis for improvement of these low altitude CNS services within the National Airspace System ( NAS ) in order to better support rotorcraft operations. The Rotorcraft Master Plan advocates the establishment of additional CNS facilities as well as the analysis and development of systems to satisfy the increasing demand for widespread IFR rotorcraft operations within the NAS. The findings of this study will aid the FAA decisionmaking in that regard. In view of prior implementation decisions on Loran-C, the emphasis in this effort is on communications and surveillance.</p> <p>This interim report provides background data on the rotorcraft industry as it exists today, as well as forecasts to the year 2007 for the purpose of providing operational data for analyses of long-term CNS benefits and costs. It describes rotorcraft missions; selects those most likely to benefit from increased availability of CNS services; identifies the probability of various ceiling and visibility combinations within selected rotorcraft operating areas; and presents an inventory of rotorcraft activity by mission and location.</p>					
17. Key Words Helicopter      Helicopter Missions Rotorcraft      Helicopter Operations Helicopter Forecasts				18. Distribution Statement  This document is available to the public through the National Technical Information Service, Springfield, Virginia 22161	
19. Security Classif. (of this report) Unclassified		20. Security Classif. (of this page) Unclassified		21. No. of Pages 165	
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1. Report No. DOT/FAA/DS-89/17,I	2. Government Accession No. ADA 214 084	3. Recipient's Catalog No.	
4. Title and Subtitle Accident/Incident Data Analysis Database Summaries (Vol. I)		5. Report Date March 1989	
		6. Performing Organization Code	
		8. Performing Organization Report No.	
7. Author(s) T.P. Murphy, R.J. Levendoski		10. Work Unit No. (TRAIS)	
9. Performing Organization Name and Address RJO Enterprises, Inc. 4550 Forbes Boulevard Lanham, MD 20706		11. Contract or Grant No. DTFA01-87-Y-01043	
		13. Type of Report and Period Covered	
12. Sponsoring Agency Name and Address Department of Transportation Federal Aviation Administration 800 Independence Avenue, S.W. Washington, D.C. 20591		14. Sponsoring Agency Code ADS-210	
15. Supplementary Notes Flightcrew Systems Research Branch, ADS-210 Martin J. Lynn			
16. Abstract <p>This two volume report provides a compendium of the existence, availability, limitations, and applicability of aviation accident and incident databases for use in human factors research. An aviation and data processing oriented form was used to survey 41 U.S. Government, military, aircraft manufacturers, airlines, special interest groups, and international aviation safety database sources. The compendium in Volume I presents information about 34 aviation safety databases.</p> <p>Recommendations include a feasibility study of a combined master aviation safety database, the convening of a task force to standardize human factors terminology and data collection, the establishment of a limited immunity program to facilitate the flow of air carrier incident data, and a more vigorous effort to present available aviation safety information to pilots.</p> <p>Appendices are contained in Volume II to provide detailed information about database collection forms, data structures, and human factors information within the database.</p>			
17. Key Words Aviation Accident Aviation Incident Database Compendium Human Factors		18. Distribution Statement This document is available to the U.S. public through the National Technical Information Service, Springfield, Virginia 22161	
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1. Report No. DOT/FAA/DS-89/17, II	2. Government Accession No. ADA 214 094	3. Recipient's Catalog No.	
4. Title and Subtitle Accident/Incident Data Analysis Database Summaries (Vol. II)		5. Report Date March 1989	
		6. Performing Organization Code	
7. Author(s) T.P. Murphy, R.J. Levendoski		8. Performing Organization Report No.	
9. Performing Organization Name and Address RJO Enterprises, Inc. 4550 Forbes Boulevard Lanham, MD 20706		10. Work Unit No. (TRAIS)	
		11. Contract or Grant No. DTFA01-87-Y-01043	
12. Sponsoring Agency Name and Address Department of Transportation Federal Aviation Administration 800 Independence Avenue, S.W. Washington, D.C. 20591		13. Type of Report and Period Covered	
		14. Sponsoring Agency Code ADS-210	
15. Supplementary Notes Flightcrew Systems Research Branch, ADS-210 Martin J. Lynn			
16. Abstract <p>This two volume report provides a compendium of the existence, availability, limitations, and applicability of aviation accident and incident databases for use in human factors research. An aviation and data processing oriented form was used to survey 41 U.S. Government, military, aircraft manufacturers, airlines, special interest groups, and international aviation safety database sources. The compendium in Volume I presents information about 34 aviation safety databases.</p> <p>Recommendations include a feasibility study of a combined master aviation safety database, the convening of a task force to standardize human factors terminology and data collection, the establishment of a limited immunity program to facilitate the flow of air carrier incident data, and a more vigorous effort to present available aviation safety information to pilots.</p> <p>Appendices are contained in Volume II to provide detailed information about database collection forms, data structures, and human factors information within the database.</p>			
17. Key Words Aviation Accident Aviation Incident Database Compendium Human Factors		18. Distribution Statement This document is available to the U.S. public through the National Technical Information Service, Springfield, Virginia 22161	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 280	22. Price

1. Report No. DOT/FAA/CT-TN89/21	2. Government Accession No. ADA 214 085	3. Recipient's Catalog No.	
4. Title and Subtitle  HELICOPTER VISUAL SEGMENT APPROACH LIGHTING SYSTEM (HALS) TEST REPORT		5. Report Date June 1989	
		6. Performing Organization Code ACD-330	
		8. Performing Organization Report No.  DOT/FAA/CT-TN89/21	
7. Author(s) Barry R. Billmann and Scott Shollenberger		9. Performing Organization Name and Address Department of Transportation Federal Aviation Administration Technical Center Atlantic City International Airport, N.J. 08405	
12. Sponsoring Agency Name and Address Department of Transportation Federal Aviation Administration Maintenance and Development Service Washington, D.C. 20590		10. Work Unit No. (TRAIS)	
		11. Contract or Grant No. T07C1U	
		13. Type of Report and Period Covered Technical Note August 1988	
14. Sponsoring Agency Code			
15. Supplementary Notes			
16. Abstract  This Technical Note reports on a test designed to obtain pilot performance subjective pilot data on the Helicopter Visual Segment Approach Lighting System (HALS). Results identify the performance measures which correlate with the pilot's ability to visually acquire a HALS equipped heliport. Conclusions state that HALS can support existing minima to heliports. Pilots reported unacceptable Cooper-Harper ratings for rate of closure and workload without HALS.			
17. Key Words Helicopter Lighting System (HALS) TERPS Helicopters MLS		18. Distribution Statement This document is available to the U.S. public through the National Technical Information Service, Springfield, Virginia 22161.	
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1. Report No. DOT/FAA/CT-89/22	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle  AIRCRAFT LIGHTNING PROTECTION HANDBOOK		5. Report Date September 1989	
		6. Performing Organization Code	
7. Author(s) F. A. Fisher and J. A. Plumer*      R. A. Perala**		8. Performing Organization Report No. DOT/FAA/CT-89/22	
9. Performing Organization Name and Address  *Lightning Technologies Inc. 10 Downing Parkway Pittsfield, MA 01201		10. Work Unit No. (TRAIS)	
		11. Contract or Grant No. DTFA03-86-C-00049	
12. Sponsoring Agency Name and Address U. S. Department of Transportation Federal Aviation Administration Technical Center Atlantic City International Airport, NJ 08405		13. Type of Report and Period Covered  Handbook	
		14. Sponsoring Agency Code ACD-230	
15. Supplementary Notes  ** Electro Magnetic Applications Inc., Denver, Colorado 80226 Program Manager: Michael Glynn, FAA Technical Center			
16. Abstract  This handbook will assist aircraft design, manufacturing, and certification organizations in protecting aircraft against the direct and indirect effects of lightning strikes, in compliance with Federal Aviation Regulations. It presents a comprehensive text to provide the essential information for the in-flight lightning protection of all types of fixed/rotary wing and powered lift aircraft of conventional, composite, and mixed construction and their electrical and fuel systems.  The handbook contains chapters on the natural phenomenon of lightning, the interaction between the aircraft and the electrically charged atmosphere, the mechanism of the lightning strike, and the interaction with the airframe, wiring, and fuel system. Further chapters cover details of designing for optimum protection; the physics behind the voltages, currents, and electromagnetic fields developed by the strike; and shielding techniques and damage analysis. The handbook ends with discussion of test and analytical techniques for determining the adequacy of a given protection scheme.			
17. Key Words Lightning Protection Fuel Vapor Ignition Fuel System Safety Atmospheric Electrical Hazards		18. Distribution Statement Document is available to the public through the National Technical Information Service, Springfield, Virginia 22161	
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Technical Report Documentation Page

1. Report No. DOT/FAA/CT-89/30		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle STATISTICS ON AIRCRAFT GAS TURBINE ENGINE ROTOR FAILURES THAT OCCURRED IN U.S. COMMERCIAL AVIATION DURING 1986				5. Report Date January 1990	
				6. Performing Organization Code PE32	
7. Author(s) R. A. Delucia/J. T. Salvino, NAPC B. C. Fenton, FAA Technical Center				8. Performing Organization Report No. NAPC-PE-188	
9. Performing Organization Name and Address Commanding Officer Naval Air Propulsion Center P.O. Box 7176 Trenton, NJ 08628-0176				10. Work Unit No. (TRAIS)	
				11. Interagency Agreement DOD/FA7INA AP98	
12. Sponsoring Agency Name and Address Department of Transportation Federal Aviation Administration Technical Center Atlantic City International Airport, NJ 08405				13. Type of Report and Period Covered Final Report	
				14. Sponsoring Agency Code ACD-210	
15. Supplementary Notes					
16. Abstract  This report presents statistical information relating to gas turbine engine rotor failures which occurred during 1986 in U.S. commercial aviation service use. Two hundred forty-nine failures occurred in 1986. Rotor fragments were generated in 140 of the failures, and of these 16 were uncontained. The predominant failure involved blade fragments, 93 percent of which were contained. Two disk failures occurred and all were uncontained. Sixty-five percent of the 249 failures occurred during the takeoff and climb stages of flight.  This service data analysis is prepared on a calendar year basis and published yearly. The data are useful in support of flight safety analyses, proposed regulatory actions, certification standards, and cost benefit analyses.					
17. Key Words Air Transportation Aircraft Hazards Aircraft Safety Gas Turbine Engine Rotor Failures Containment				18. Distribution Statement This document is available to the public through the National Technical Information Service, Springfield, Virginia 22161	
19. Security Classif. (of this report) Unclassified		20. Security Classif. (of this report) Unclassified		21. No. of Pages 25	
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1. Report No. DOT/FAA/CT-TN89/31	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle  HELIPORT IDENTIFICATION BEACON		5. Report Date April 1989	
		6. Performing Organization Code ACD-110	
		8. Performing Organization Report No. DOT/FAA/CT-TN89/31	
7. Author(s) Paul H. Jones		10. Work Unit No. (TRIS)	
9. Performing Organization Name and Address  Federal Aviation Administration Technical Center Atlantic City International Airport, NJ 08405		11. Contract or Grant No.	
		13. Type of Report and Period Covered  Technical Note	
12. Sponsoring Agency Name and Address U.S. Department of Transportation Federal Aviation Administration Technical Center Atlantic City International Airport, NJ 08405		14. Sponsoring Agency Code	
15. Supplementary Notes			
16. Abstract  The International Civil Aviation Organization (ICAO) has proposed the adoption of a standard international heliport beacon. This beacon consists of a white strobe light coded to display a sequence of four flashes that signify the Morse code letter "H". For evaluation purposes, the proposed strobe beacon was compared to the United States standard three-color rotating beacon. Pilots completed post-flight questionnaires after viewing both beacons. Without any clear-cut choice as to which beacon was the best, pilot responses indicated that both beacons provide adequate guidance in locating a heliport. From these results, we conclude that there does not appear to be reasonable cause for opposing adoption of the proposed strobe beacon as an ICAO standard. Furthermore, there does not appear to be any compelling reason to change the present United States standard for heliport identification beacons at this time.			
17. Key Words  Beacons Strobe		18. Distribution Statement  Document is on file at the Technical Center Library, Atlantic City International Airport, NJ 08405	
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1. Report No. DOT/FAA/DS-89/32	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle Indianapolis Downtown Heliport - Operations Analysis and Marketing History		5. Report Date March 1990	
		6. Performing Organization Code	
7. Author (s) Deborah J. Peisen Robert B. Newman		8. Performing Organization Report No. 90RR-13	
9. Performing Organization Name and Address Systems Control Technology, Inc. 1611 North Kent Street, Suite 910 Arlington, Virginia 22209		10. Work Unit No. (TRIS)	
		11. Contract or Grant No. DTFA01-87-C-00014	
12. Sponsoring Agency Name and Address U.S. Department of Transportation Federal Aviation Administration 800 Independence Avenue, S.W. Washington, D.C. 20591		13. Type Report and Period Covered Final Report	
		14. Sponsoring Agency Code ADS - 220	
15. Supplementary Notes ADS - 220 Rotorcraft Technology Branch, System Technology Division			
16. Abstract  <p>In response to increasing helicopter demand, the Federal Aviation Administration (FAA) initiated the FAA/ Industry National Prototype Heliport Demonstration and Development Program. Four cities were selected for the FAA Demonstration program, these were; New York, New Orleans, Los Angeles and Indianapolis. In January 1985, the Indianapolis Downtown Heliport was the first of the demonstration heliports to open.</p> <p>This study is an analysis of the operational characteristics of the Indianapolis Downtown Heliport from its opening in 1985 through March 1989, and an investigation of the marketing techniques used during the planning and development stages of the heliport as well as the continuing marketing effort used to retain and increase business. It performs this analysis using data collected by the heliport. The parameters examined concentrate on the types of missions, the variations and trends in the number of operations, the geographic distribution of the helicopters that use the facility, and the types of services required by the helicopter operators using the heliport.</p> <p>Due to limitations in the amount and accuracy of data available, only generalized trends rather than detailed statistical conclusions could be developed.</p> <p>A similar analysis is being performed for the Downtown Manhattan Heliport (Wall Street) in New York City.</p>			
17. Key Words Indianapolis Downtown Heliport Operations Analysis Marketing Analysis Development Marketing		18. Distribution Statement This document is available to the U.S. public through the National Technical Information Service, Springfield, Virginia 22161	
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1. Report No. DOT/FAA/DS-89/37	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle An Early Overview of Tiltrotor Aircraft Characteristics and Pilot Procedures in Civil Transport Applications		5. Report Date December 1989	
		6. Performing Organization Code	
7. Author(s) David L Green, Harold Andrews, Michael Saraniero		8. Performing Organization Report No.	
9. Performing Organization Name and Address Starmark Corporation Suite 507, 1745 Jefferson Davis Highway Arlington, VA. 22202		10. Work Unit No. (TRAIS)	
		11. Contract or Grant No. DTFA01-89-P-01074	
12. Sponsoring Agency Name and Address Federal Aviation Administration Advanced System Design Service Rotorcraft Technology Branch Washington, D.C. 20591		13. Type of Report and Period Covered Final Report	
		14. Sponsoring Agency Code ADS-220	
15. Supplementary Notes			
16. Abstract  <p>This document provides a brief description of tiltrotor aircraft and identifies some of their projected operating characteristics. Two operations are of particular interest: 1) steep approaches into a confined metropolitan vertiport, and 2) approaches into a vertiport without sufficient clear airspace for a conventional missed approach from a low DH. Both operations are of interest in order to minimize the airspace needed to conduct such operations.</p> <p>A brief simulation was conducted to support the analysis using a fixed base simulator. The flight simulation involved a quick look at innovative and tiltrotor unique maneuvers to identify and evaluate operations at or near the operational limits. The tiltrotor shows promise of permitting much steeper approach and departure maneuvers than what can be done with either an airplane or a helicopter.</p>			
17. Key Words tiltrotor aircraft characteristics pilot procedures		18. Distribution Statement  This document is available from the organization in block 12.	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 77	22. Price